

Oil and Gas as renewable resources

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Non progredi est regredi.

The problem of increasing global energy needs is more every year and distinct disturbing for the human civilization. According to the experts, in 30 years the necessary amounts of energy resources will increase by two-thirds. Moreover, more than 70% of the demand will be met with a hydrocarbon that is why such progressive increase in production of these raw materials is inevitable. However, the production of these products is not unlimited. According to current estimates, both fuels are non-renewable mineral resources. If so, then we are already seeing the bottom of hydrocarbon wells.

In the beginning of the last century, geologists have found that the formation of oil and gas still has a place to be! However, an extremely low rate of hydrocarbon deposits formation is not comparable with the speed of oil and gas extraction during the operation of fields. So hydrocarbons were considered to be non-renewable mineral resources.

However, summing of the known facts and new observations show that the process deposit migration and formation (or reformation) is quite quick. It can be a few years!

A classic example of this is the fields in the Terek-Sunzha district (Chechen Republic). The first wells were drilled there in the field of natural oil showings in 1893 not far from Grozny and were named Starogroznskoye oil-field. In 1895 one of wells gave a grand fountain of oil at the depth of 140 m. Flow rate reached one million pounds per day (6250 m / s). After 12 days of flowing the walls of the oil-storage pit collapsed and the flow of oil flooded the oil-derricks located near the wells. It was managed to tame fountain only 3 years later. Thus began the history of the development of oil deposits in Grozny district. For half a century of Neogene sand clay

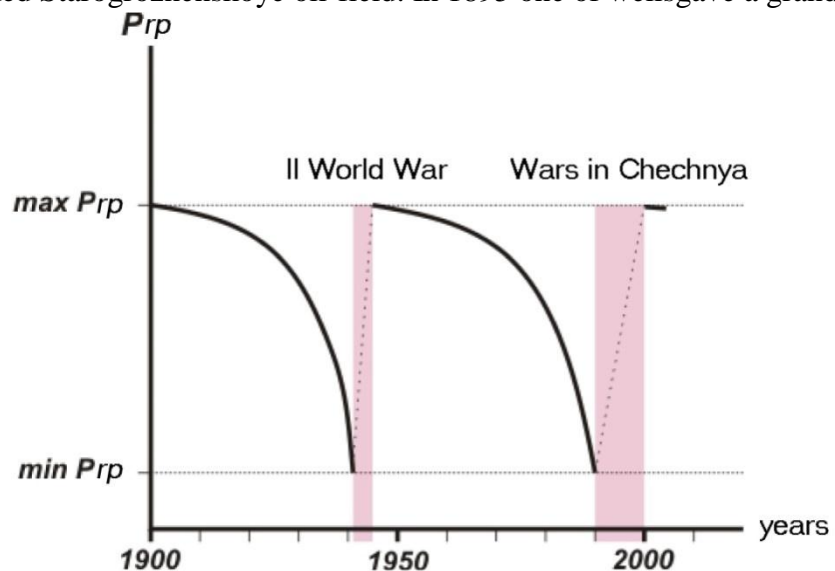


Fig.1

sediments exploitation about 100 million tons of oil were extracted. As a result the productive formations were depleted and the natural lift mechanism was replaced with the artificial lift mechanism. The amount of crude oil, according to the calculations of a mining engineer L.I. Baskakova, the discoverer of Grozny deposits, could not fit in all the known structures of the area and adjacent valleys. By the beginning of the Great Patriotic War (1941) all wells

were flooded and some of them were conserved. They did not work for the entire war period (1941-1945). After the onset of the peace the wells were reopened and production restored. It turned out that almost all highly flooded the wells, where before the war forced extraction was carried out, began to give dry crude oil, i.e., within 3-4 years of inactivity a rearrangement of deposits occurred: water formed a new oil water contact due to the effect of subsidence (Fig.1).

At a number of fields in Western Siberia there also recorded a pulsating regime of oil wells. As an example, the curves of flow rates at Ust-Balyksky deposits show that for the period from 1967 to 1991. Production rates in wells repeatedly increases and decreases (Fig. 2a - d). The same effect was observed in the areas of Terek-Sunzha district (the October field, Fig. 2, e). There is speculation that this is the result of the rapid, in geological terms, process of oil and gas in formation at the specific and currently developed hydrocarbons outbreaks.

Where and how are hydrocarbons formed today? According to concept of petroleum geodynamic formation develop at the Department of Geology at the State University of Oil and Gas in the name of Gubkin education oil and gas can be formed in various ways:

- In large crustal classical basins, according to the scheme;
- In rift depressions, appearing at the disclosure of ocean basins;
- In subduction zones, where there is a collision of two plates when a thin oceanic crust sinks beneath a thick crust of the continents.

In relation to the North Caucasus and the Terek-Sunzha district, where deposits are located in Chechen Republic, there is a subduction mechanism of hydrocarbon formation. Along the entire Crimea-Caucasus structure, which is a border where small plates clashes with the East European continent, intracontinental subduction is currently happening, that is expressed in the fact that the lower level of the lithosphere as it is leaking under counter obstruction, thick continental lithosphere, and the upper level warps, cracks and forms a conglomeration of different scale crustal blocks. Fig. 3 is a sectional view through the

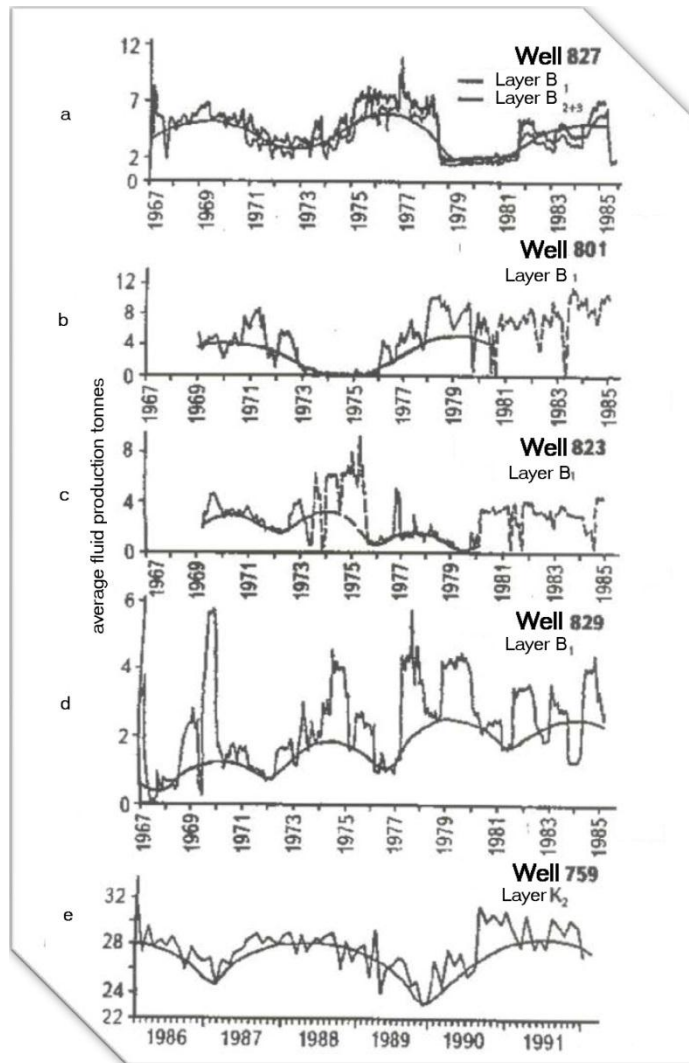


Fig.2

Caucasus Mountains. You can see how the lower level of the lithosphere deepens under Scythian plate and the top is crushed and takes part in the formation of the Caucasian ridge. See figure 3.

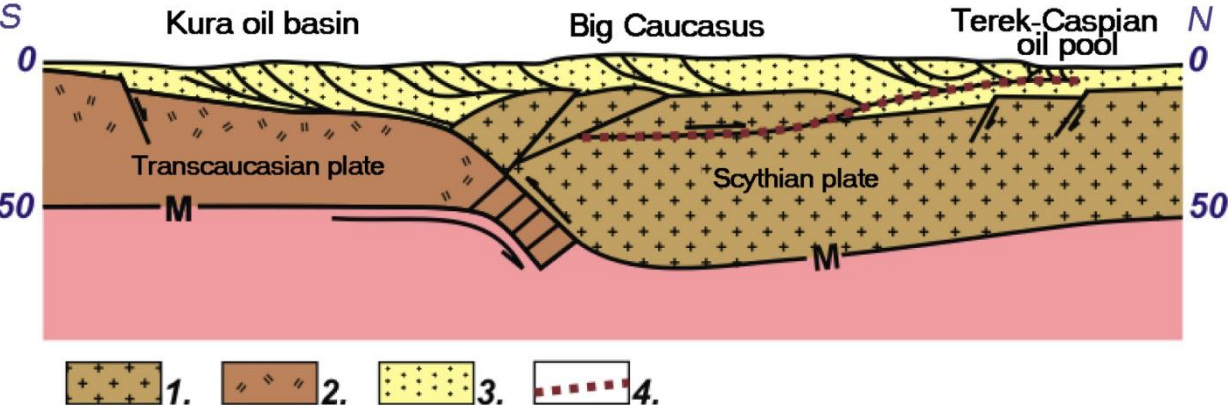


Fig.3

Thus, any accumulation of liquid or gaseous hydrocarbons is a kind of dynamic equilibrium, but at the same time open, dissipative system capable to heal itself in a relatively short period of time, measured in years.

We have seen only three real examples of possible mechanisms of new oil and gas reserves formation, but in the nature there can be much more of them. In each case there is an effective hydrocarbon source. In the Earth's geological history hydrocarbon compounds are constantly formed, right in front of our eyes, and this process will continue in the future. With this thesis, we reaffirm the fundamental concepts of Academician Gubkin that formation of oil and gas is global and permanent.

As a result of the abovementioned and on the basis of the thesis that oil and gas are renewable natural resources, the development of their fields should be built on the basis of the scientifically based balance of natural hydrocarbon generation and the extraction volume in the process of their development.