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A New Technology for Enhanced Hydrocarbon Production

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SUMMARY

Our Technology has an aim of equal influence on medium in order to save oil deposit, increase oil production and recovery and minimize negative effects from outside impacts. This Technology is capable resolving these problems successfully and with the high rate result.

The Technology of oil output and recovery increase is based on the discovery of previously unknown behavior of week high frequency seismic signals, microseism, which was recognized and by the USSR State Committee for Discoveries and Inventions in March 1988 granted a status of Scientific Discovery of a new physic phenomenon. Which is connected with understanding of the geophysical medium not as the static object but as a dynamic one, with permanently changing parameters and properties.

Diagnostics of the medium condition using a seismic and other geophysical fields monitoring allows to determine dynamics of its variations under the impact of natural or artificial factors. Exactly for describing these very effects we determined terms “geophysical medium”, “active geophysical medium”, “tensosensitive medium”, “tensosensitive points”, “active or non-active faults”, and etc. The studies have shown that at weak energy level geophysical medium manifests high dynamic activity and exceptional sensitivity to any external impact, and even slight non controlled activity can lead to considerable disturbances in the processes proceeding in it.

The analysis showed that there should be a change in the current way for the oil and gas fields’ development and exploitation. In real practice the harmful factors which affect the medium of the oilfields are the methodology of their development and exploitation itself: these processes of liquid production and injection do not count any relationship between them and processes taking place within the medium.

It needs to emphasize that the Technology is unique in its kind in the world. The worsening of the global ecologic situation is getting very rapidly and we do not realize its true scale. Meanwhile, the distractive processes not only affect the environments that make up the planet’s surface but also the Earth's interior: it was observed that great disturbances in one of the planet’s spheres cause the disturbances which occur in other ones. All above surface processes accompanied by underground ones, and this kind of impact to environment are more powerful and stable.

Observed worsening of the global ecologic system due to long-term human uncontrolled activity has impact both on surface and underground processes. And one of their consequences is rapid water-cuts and destruction of the oilfields. It’s necessary to take measures to prevent these processes which will rehabilitate the oilfields to some extend.

If we access the deceases in oil output, and distraction of the oilfields (meaning, oil reserves), which have happened in the last decade, the estimates of real economic losses due to negative ecological effects will rise many times. And it affects interests of all the countries. The studies have reviled also the interconnections between oil wells, group of the oil wells and even between oil fields which negatively results on oil production levels.

The implementation of the Technology would have led to reveal all the outside impact factors and to take the necessary measures which would help not only to increase output, but also to prevent further destruction of the oilfield: thus the Technology is applicable also for protection of the oilfield from outside impacts. And it was successfully implemented for many years in oilfields of different regions. Therefore, the entire material shows that the medium condition is altered permanently by the impacts. And it is very important to note that the alterations are different for the different volumes of the medium.

The Technology has been awarded patents by Eurasian (2000), European (2005) and Canadian (2008) regulatory bodies. It is based on utilization of the seismic vibrations impacts, which affect the earth surface, covering the whole oil field in order to increase the stressed state of the medium containing the oilfield. As a result it leads to increase of layer pressure, and, thus, intensification of the oil extraction. The experimental data convincingly shows that

the Technology can be utilized for oil fields with wide scale spectrum of oilfield's properties such as depth, layers' pressure, water-cut, rock properties, etc.

The Technology is intended to be applied to mature and exhaust oilfield, which are needed to stimulate oil output and maintain strata pressure. Evaluation of effectiveness of the Technology is given on the basis of comparative analysis of oil production data and changes of geophysical fields. Most informatively changes of the stressed state of the medium are reflected in behavior of microseisms and in variations of intensities of gravity field on the earth surface and of electromagnetic waves in all depths. (Fig. 1).

In the territory of the oilfields, permanent seismological surveys and pressure measurements are being conducted as well as periodical gravitational and topographical observation. Based on these works, the corrections of the models of the medium condition and vibration impacts are being made.

Utilization of the Technology corrects large-scale disturbances in the oilfield medium, which had been caused by oil exploitation in the previous years, and brings the medium into energetically homogeneous state. And this ensures the main achievement of the Technology: ultimately, it provides increase in oil recovery up to 60-70% and even more depending of the oilfield medium geological and geophysical characteristics. (Fig. 2, 3)

Many year of the Technology implementation always followed by the positive results and not revealed any negative impact on the oilfield. The results of its commercial application during last 12 years on the different oil fields have proved high efficiency of the Technology. It allowed to increase oil output by 15-30%, maintain this elevated level of the output for long period of time and would allow significantly decrease oil production costs. (Fig.4)

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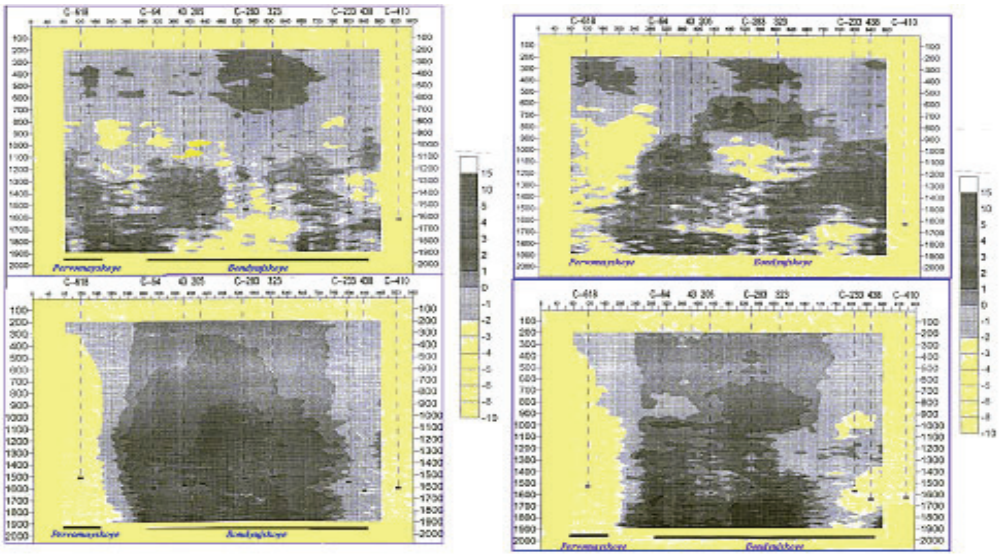
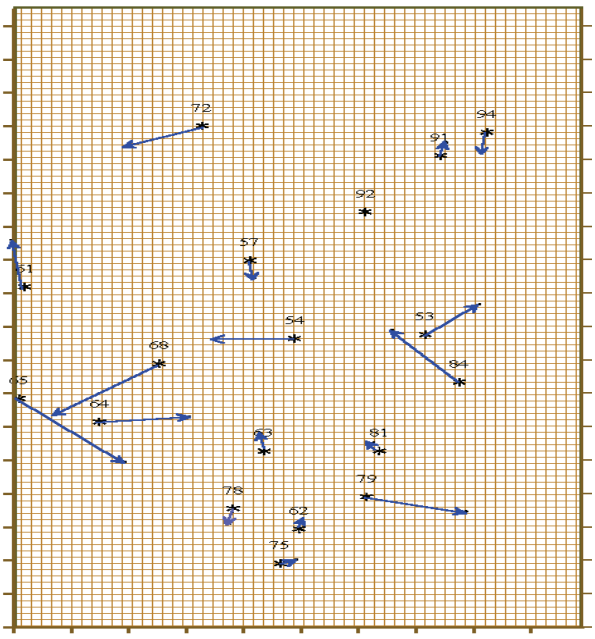
Vertical latitude and longitude cross sections of electromagnetic field energy distribution in the medium for profile 25 km (Pervomayskoye and Bondujskoye oil fields) (Fig.1)

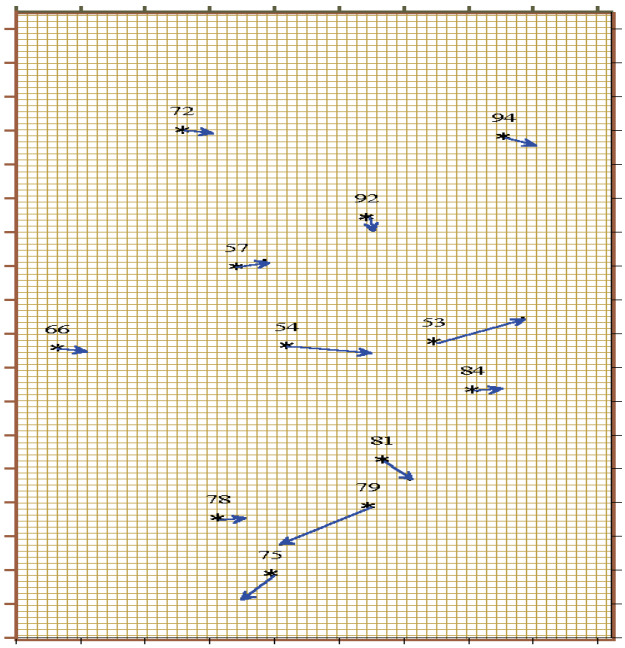


Topography observation points with vectors of horizontal surface motion (500 km^2) (Fig. 2)

1996-97

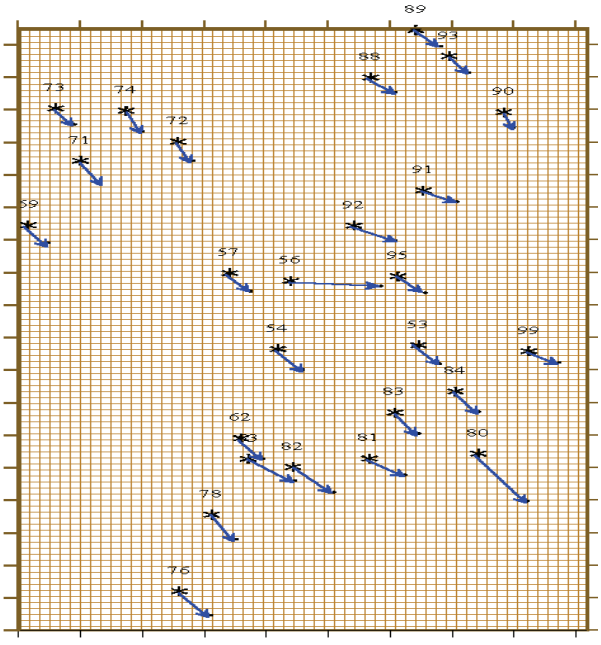


1997-99

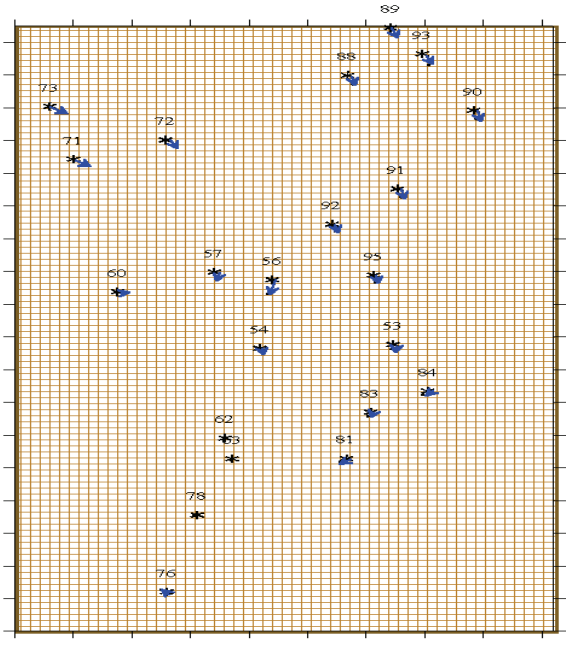


Chaotic surface motions before
the Technology implementation

2000 – 2001

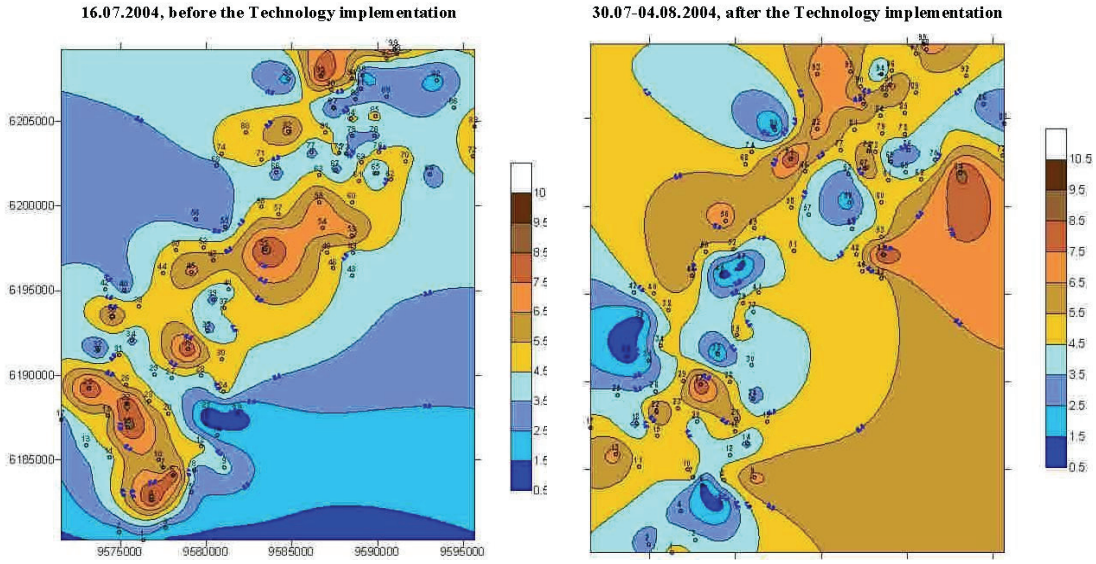


2001 – 2005



Returned to natural state

Stress distribution within the medium at Pervomayskoye, Komarovskoye and Bondyujskoye oil fields before and after the vibrational impacts (500 km^2) (Fig. 3)



Oil production on Bondyujskoye, Pervomaiskoye and Komarovskoye oil fields of the OGPD "Prikamneft" from January 1988 to May 2005. (Fig.4)