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Well Driling

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APPLICATION OF DRILLING OF MULTILATERAL WELL ON THE BASIS OF NEW TECHNOLOGY AND MODEL IN SOUTH CASPIAN BASIN

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A b s t r a c t

The article discusses the issue of drilling multilateral horizontal wells and provides a brief history of its development. Data were provided on the selection of the location of the multilateral horizontal well, drilling the main wellbore and determining the depth for running the casing strings. This paper also analyzes the selection of lateral wellbore penetration depth, the importance of drilling multilateral horizontal wells and their application for the first time in the shelf water of South Caspian Basin, at the Western Absheron field, Well 19.

Keywords:

Multilateral wells;
Drilling of horizontal wells;
Petrophysical models;
Drilling of main and lateral wellbores.

In the near future, the economic development of the world depends on oil and gas production in terms of energy carriers. For this reason, the efficient operation and cost reduction of the fields are still relevant.

The main goal of drilling a multilateral well was to reduce drilling costs, increase well production, improve the number of wells on the offshore platform. Thus, the drilling of several horizontal wells from one main wellbore also reduces the negative impact on the environment by reducing the number of drilling of upper horizonts. İt helps to reduce the demand for surface equipment, conductor casing on offshore platforms and casings which will be run to the upper horizonts depending on the number of horizontal wells drilled by multilateral method and for minimizing the area of drilling grounds [1].

As drilling costs are very high in the sea, drilling of multilateral wells is more efficient, on the other hand, with the aggravation of mining and geological conditions, the need for such technologies began to increase in dry fields, and for some projects, drilling of multilateral wells became the only possible solution for their successful implementation.

This drilling technology can be used to re-drill active wells or to open lateral wellbores, increasing the volume of wells' debit and extracted reserves in terms of strategy. Recently, the drilling of a multilateral well has become an important tool in the world oil and gas production practice.

The first technology patent for the application of multilateral well was registered in the USA in 1929. Many attempts to drill such a well have failed. The first successful multilateral well was drilled in Bashkortostan in 1953.

For the first time in the south Caspian Basin, SOCAR-AQS drilled and commissioned the multilateral well No. 19 as a pilot project with the support of Baker Hughes service and HalliBurton directional drilling service in the West Absheron field.

While designing of drilling process of multilateral well No. 19, the selection of the location of the multilateral well in the West Absheron field is one of the important conditions and it was implemented in accordance to the well network. [2]. The horizontal wells to be drilled at this time did not enter the drainage area of any well and were placed in sufficient range from other wells. There are also zones of productive horizons of the field, in which there is a very low dynamic conductivity, which does not allow the production of residual oil. This factor was also taken into account and the lateral bore of the multilateral was directed to that zone.

The main bore of the well was drilled in the West Absheron field with the risk of collision as in the other drilled horizontal wells, casing strings running depth was determined and completed according to the Geological static model (fig.1). These depths were also determined by petrophysical models, correlations [3]. The depth of the production casing has been 668 m.

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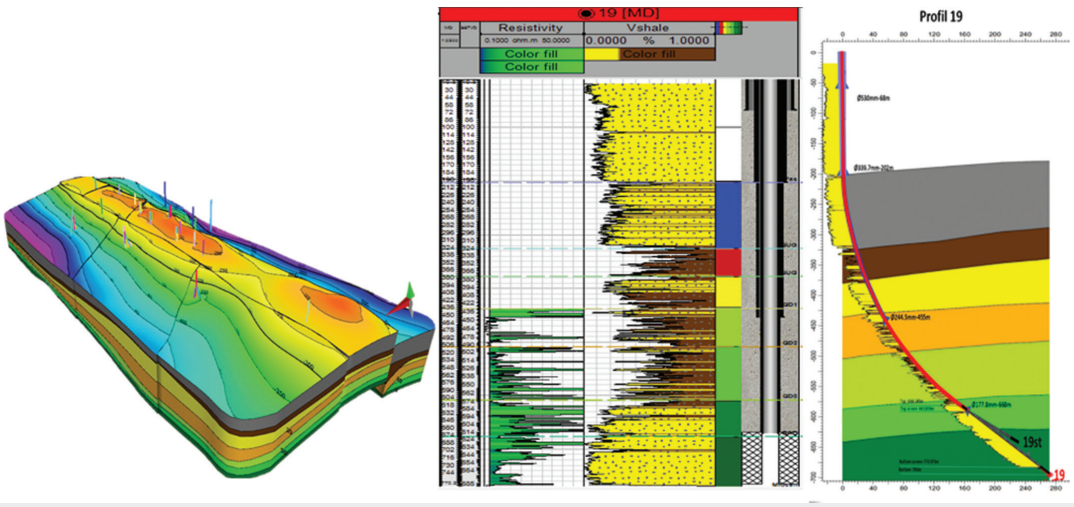

Fig.1. Geological static model

In 1998, the non–commercial organization for the technological development of the construction of multilateral wells created the classification of multilateral wells (Technical Advancement of multitaterals, TAML). Based on this classification, 6 levels of TAML are available (fig.2). The selection of the level depends on the hermetic requirements dictated by the mining-geological conditions laid on the wellbores and their compounds.

Some conditions were expected when the location of the «window» interval to be opened in the production casing was determined as the completion of the well No. 19 was designed in accordance with the 3rd level of International (TAML) classification.

1. In the interval to be opened «window» there should be a quality and whole layer of cement behind the production casing, on the other hand, this interval should not subside into place of moft joint. In the same interval, geophysical measurement works (ACS) were carried out and the quality of cementing was checked and based on the CCL (Logator moft) measurement, it was determined that there was no moft combination (fig.3).

2. The deflector (whipstock equipment) should be placed at the maximum close distance to the float shoe which installed while cementing process of production casing and was drilled when entering the open hole.

3. In accordance to 3rd level of TAML while completion process of lateral bore, the connection

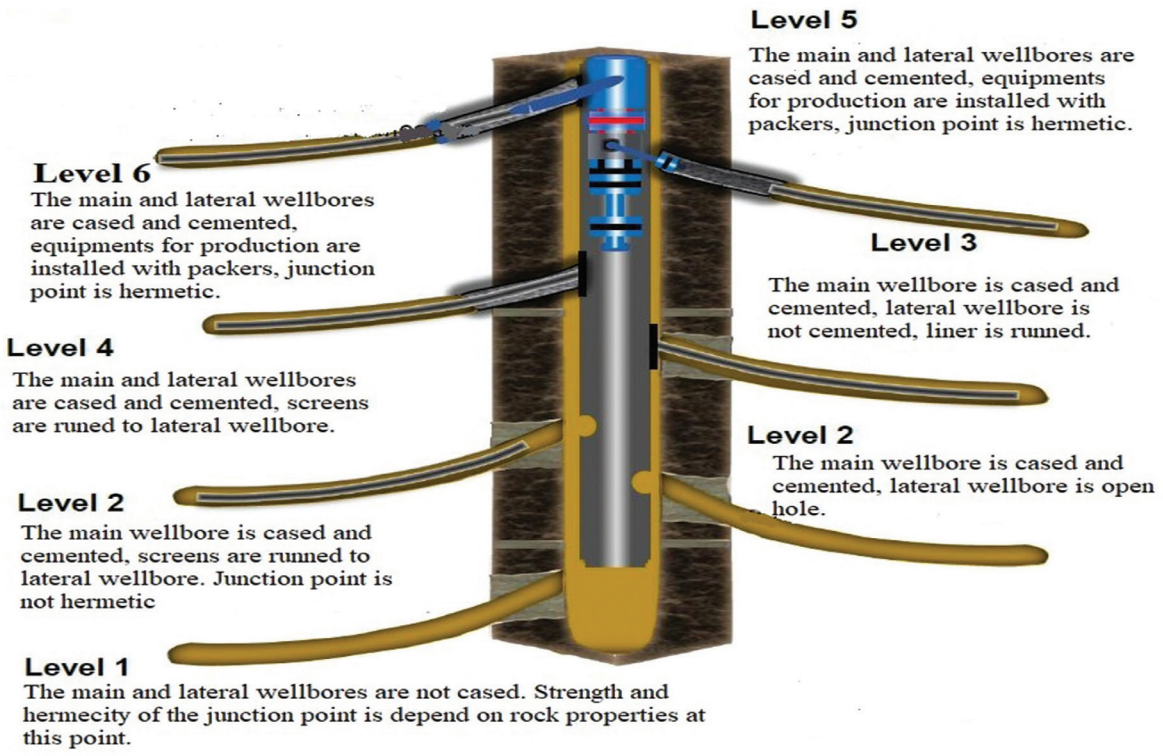

Fig.2. Clasification of multilateral wells on completion levels (TAML)

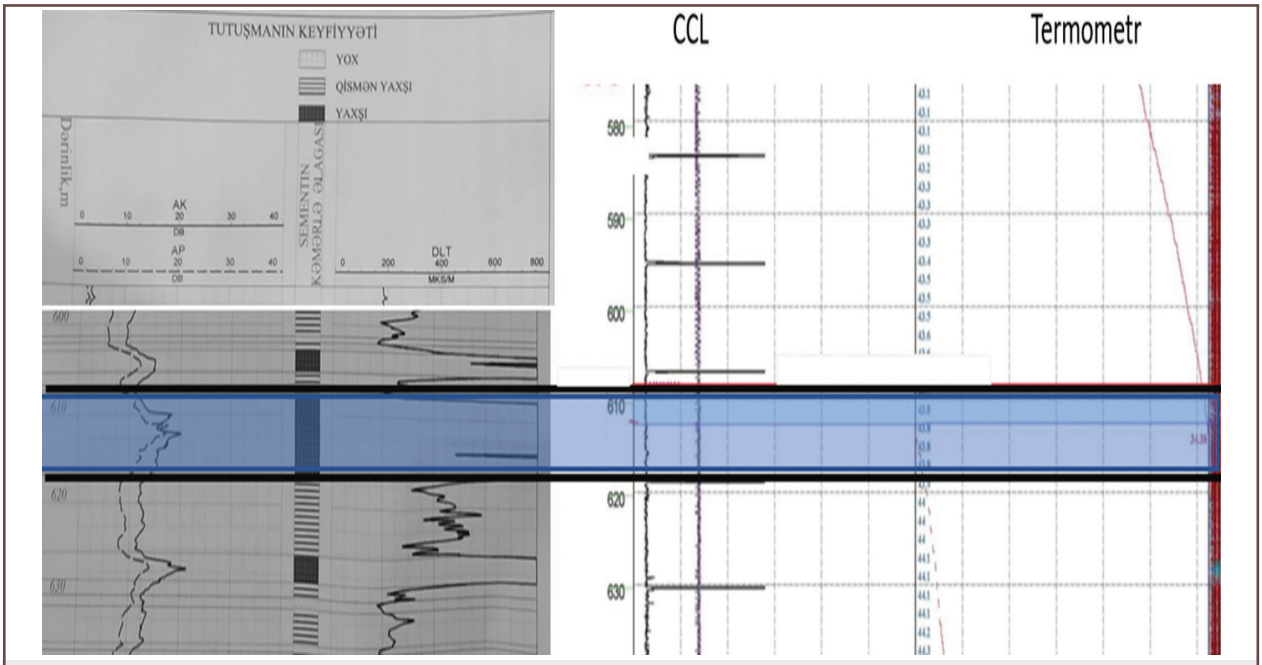

Fig.3. Carotages that determine the quality of cementing and the location of moft (AKS, CCL,Termometr)

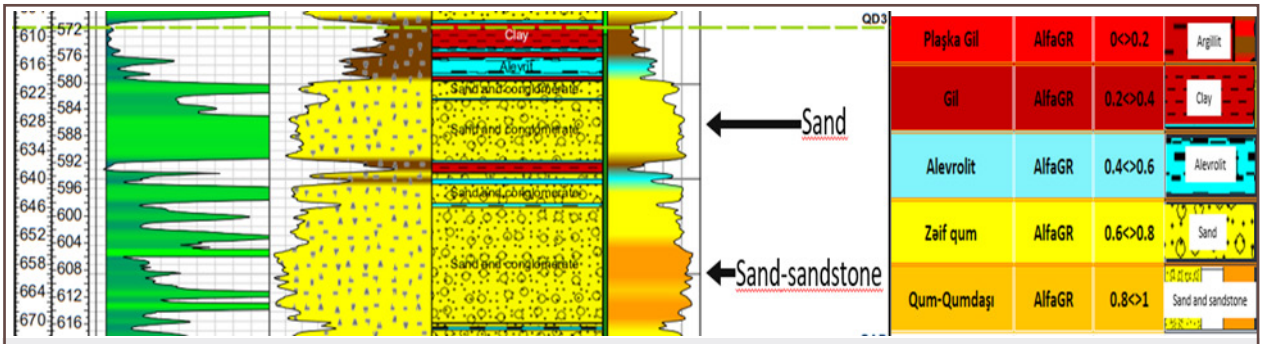

Fig.4. Lithology based on LAS

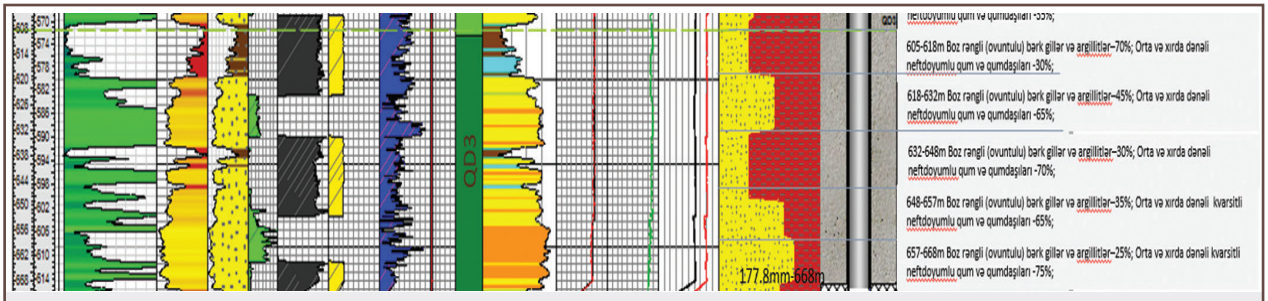

Fig.5. Slurry mainly in lithology

of the completion equipment that installed to the open hole with hook hanger to production casing and providing the hermeticity of this joint only with open hole packers and reactive element packers has been taken into account. For this reason, in order to achieve the hermeticity in the opened «window» interval, the depths' thickens for installing packers should be 20 m and the formation at this interval should be consist of solid and dense shale rock.

In order to select such kind of formation interval, the litological properties of rocks have been determined. Shale, strength, density and resistance indicators have been specified with using wireline logging and litology which confirmed with cuttings (figs. 4,5). When determining the opening interval of the lateral bore «window», petrophysical indicators of the layers, i.e. porosity, permeability, shale, oil saturation parameters were taken into account, geophysical studies were implemented in the adjacent well (fig.6). Low porosity and permeability zones, oil saturation parameter medium and low, non-aqueous formations, the zones with no more than 50% of Shale Volume were studied. All mentioned were taken into account and the interval of 607 – 619 m was selected for opening the «window».

During the drilling of the multilateral well, first

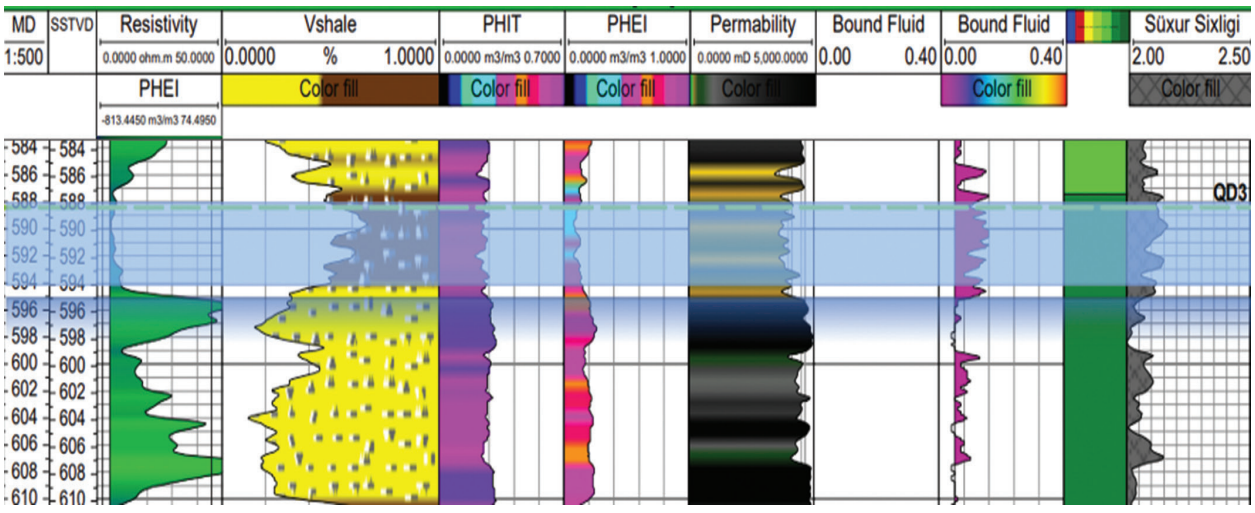

Fig.6. Geophysical studies conducted in the well

the main wellbore was drilled and the completion works were fully completed, then preparatory work was carried out for the drilling of the lateral wellbore. Thus, in order to prevent main bore from pouring of metal particles during the drilling of the lateral bore, transferring of pressure to the main bore when the deflector is seated, and mixing water-based Brine fluid of the main wellbore with the oil-based drilling fluid, a Test Plug is installed, entering the packer of the main wellbore. In accordance with the opening interval of the lateral bore (608.5 - 612.5 m), the deflector equipment and milling set were lowered and directed with LWD, then activated. The bolt which connected the deflector to the milling set was broken by giving the load and the deflector remained in the specified interval, the fluid circulation was created in the milling set. «Window» was opened in the interval of 608.5 - 612.5 m of production casing and 4 m was drilled from the new formation. Then the freezer bit was lifted and replaced with a PDC bit, drilling and completion works were completed according to the project. After the completion the well was put under production with high flow rate with using electrical submersible pump.

Conclusions

1. One main wellbore and two horizontal wells were drilled to reduce the number of casing strings and to drill the upper horizons of well
2. Only one main wellbore and two horizontal wells were drilled, and drilling, core and material and other costs were reduced.
3. The successful application of the practice of drilling a multilateral well has stimulated the drilling of multilateral horizontal wells in the active wells.

References

1. Fraija, J., Ohmer, H., Pulick, T., et al. (2002). New aspects of multilateral well construction. *Oilfields Review*, 14(3), 52-69.

2. Ehlig-Economides, C.A., Mowat, G. R., Corbett, C. (1996, April). Techniques for multibranch well trajectory design in the context of a three-dimensional reservoir model. SPE-35505-MS. In: *SPE European 3-D Reservoir Modeling Conference*.

3. Sugiyama, H., Tochikawa, T., Peden, J.M., Nicoll, G. (1997, April). The optimal application of multi-lateral/multi-branch completions. SPE-38033-MS. In: *SPE Asia Pacific Oil and Gas Conference*.

4. Schlumberger Information Solutions. 23 January 2008.

5. Technology Advancement for Multi-Laterals (TAML). https://neftegaz.ru/tech-library/burenie/142482-klassifikatsiya-taml/

Применение в акватории Южного Каспия многопрофильного бурения скважин по новой технологии и модели

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Реферат

В статье рассматривается вопрос бурения многоствольных горизонтальных скважин и приводится краткая история его развития. Была предоставлена информация о выборе места расположения многоствольной горизонтальной скважины, бурении основного ствола скважины и определении глубины для спуска колонн. В статье также анализируется выбор глубины вскрытия бокового ствола, важность бурения многоствольных горизонтальных скважин и их применение впервые в акватории Южном Каспия, на месторождении «Западный Абшерон», скважина №19.

Ключевые слова: многоствольные скважины; бурение горизонтальных скважин; петрофизические модели; бурение основных и боковых стволов.

Yeni texnologiya və model əsasında çoxşaxəli quyunun qazılmasının Cənubi Xəzər akvatoriyasında tətbiqi

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Xülasə

Məqalədə çoxşaxəli horizontal quyuların qazılması ilə bağlı məsələyə baxılmış, onun qısa inkişaf tarixi verilmişdir. Çoxşaxəli horizontal quyunun yerinin seçilməsi, əsas lülənin qazılması, kəmər endirmə dərinliklərinin təyini barədə məlumat təqdim edilmişdir. Həmçinin məqalədə yan lülənin açılma dərinliyinin seçilməsi, çoxşaxəli horizontal quyuların qazılmasının əhəmiyyəti və onların Cənubi Xəzər akvatoriyası, «Qərbi Abşeron» yatağı, 19 saylı quyuda tətbiqi təhlil edilir.

Açar sözlər: çoxşaxəli quyu; horizontal quyuların qazılması; petrofiziki modellər; əsas və yan lülənin qazılması.