

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF  
KAZAKHSTAN

K.I. Satbayev Kazakh National Research Technical University

K. Turyssov Geology and Oil-Gas Business Institute

Department of Hydrogeology, Engineering and Petroleum Geology

Gulaiym K. Izturganova

**THESIS**

**Topic:«Geological structure, oil and gas occurrence of the South-Mangyshlak system and studying the reservoir properties of the productive horizon, the effect of hydraulic fracturing on the reservoir properties of terrigenous rocks in the Uzen field»**

6B05201 – Geology and exploration of mineral deposits

Almaty 2023

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**For thesis  
TASK**

Student: *Gulaiym K. Izturganova*

Topic: *«Geological structure, oil and gas occurrence of the South-Mangyshlak system and studying the reservoir properties of the productive horizon, the effect of hydraulic fracturing on the reservoir properties of terrigenous rocks in the Uzen field»*

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List of issues considered in the diploma work

- a) *General information about oil and gas basin.*
- b) *General information about oil field.*
- c) *Filtration-capacitive properties of rocks before HF*
- d) *Fracturing efficiency analysis.*
- e) *Economic part*

The schematic materials are listed in the 22 slide

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To preparation of diploma work

**TABLE**

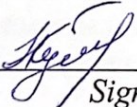
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**Signatures**

of the commission of departments of thesis  
and the controller of the norm for completed work

Title of list	Commissions, name, patronymic, surname (degree, position)	Signature date	Signature
Overview of oil and gas basin	T.S. Jarassova PhD, senior-lecturer	27.03.23	
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Fracturing efficiency analysis	T.S. Jarassova PhD, senior-lecturer	05.05.23	
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## ABSTRACT

The object of the thesis research is the Uzen oil and gas field located at the Zhetybay-Uzen tectonic step in the South Mangyshlak oil and gas region.

The thesis is intended for analysis of reservoir properties of productive horizons of the field and description of filtration-capacitive properties of rocks.

In the first and second parts of the thesis, the geological structure of the study area and field, as well as tectonics, litho-stratigraphic characteristics and oil and gas content were studied.

The practical section is devoted to studying the reservoir properties of productive horizons, determining the influence of hydraulic fracturing on the filtration-capacitive properties.

In the economic part, the economic efficiency of the fracturing method is justified, taking into account all costs.

Key words: South Mangyshlak, Uzen oil and gas field, tectonics, oil and gas content, filtration-capacitive properties, reservoir, permeability, hydraulic fracturing, geophysical studies of wells, well, crack, flow rate, water-oil contact.

The thesis consists of an annotation, content, introduction, four sections, conclusion, list of used literature. The thesis contains, 42 pages 22 figures, 6 tables.

## АНДАТПА

Дипломдық жұмыстың объектісі Оңтүстік Маңғышлақ мұнайгазды облысының Жетібай-Өзен тектоникалық сатысында орналасқан Өзен мұнай-газ кен орны болып табылады.

Дипломдық жұмыс кенорынның өнімді горизонттарның коллекторлық қасиеттерін талдауға және тау-жынысының фильтрациялық-сыйымдылық қасиеттерін сипаттауға арналған.

Дипломның бірінші және екінші бөлімінде зерттеліп отырған аудан мен кенорынның геологиялық құрылысы, тектоникасы, литолого-стратиграфиялық сипаттамасы және мұнайгаздылығы айқындалған.

Практикалық бөлім өнімді горизонттардың коллекторлық қасиеттерін сипаттауға, қабатты сумен жару әдісінің қабаттың фильтрациялық-сыйымдылық қасиеттеріне әсерін анықтауға арналған.

Экономикалық бөлімде барлық шығындарды есепке ала отырып, қабатты сумен жару әдісінің экономикалық жағынан тиімділігі негізделді.

Негізгі сөздер: Оңтүстік Маңғышлақ, Өзен кен орны, тектоника, мұнайгаздылық, фильтрациялық-сыйымдылық қасиет, коллектор, өткізгіштік, қабатты сумен жару, ұңғымаларды геофизикалық зерттеу, ұңғыма, жарықшақ, дебит, су-мұнай жапсары т.б.

Дипломның жұмыс аңдатпадан, мазмұнынан, кіріспеден, төрт бөлімнен, қорытындыдан, пайдаланылған әдебиет тізімінен тұрады. Дипломдық жұмыста 42 бет, 22 сурет, 6 кесте бар.

## **АННОТАЦИЯ**

Объектом исследования дипломной работы является Узенское нефтегазовое месторождение, расположенное на тектонической ступени Жетыбай-Узень в Южно-Мангышлакской нефтегазовой области.

Дипломная работа предназначена для анализа коллекторских свойств продуктивных горизонтов месторождения и описания фильтрационно-емкостных свойств горных пород.

В первой и второй части диплома изучены геологическое строение исследуемого района и месторождения, а также тектоника, литоло-стратиграфическая характеристика и нефтегазоносность.

Практический раздел посвящен изучению коллекторских свойств продуктивных горизонтов, определению влияния гидравлического разрыва пласта на фильтрационно-емкостные свойства пласта.

В экономической части обоснована экономическая эффективность метода ГРП с учетом всех затрат.

Ключевые слова: Южный Мангышлак, Узенское месторождение, тектоника, нефтегазоносность, фильтрационно-емкостные свойства, коллектор, проницаемость, гидравлический разрыв пласта, геофизические исследования скважин, скважина, трещина, дебит, водонефтяной контакт.

Дипломная работа состоит из аннотации, содержания, введения, четырех разделов, заключения, списка использованной литературы. Дипломная работа содержит из 42 страниц, 22 рисунков, 6 таблиц.

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## INTRODUCTION

In order to increase the economic efficiency of field development, reduce direct capital investments and maximize the possible use of investments, it is customary to divide the entire field development period into three main stages.

At the first stage, natural energy of the formation is used as much as possible for oil production (elastic energy, energy of dissolved gas, energy of boundary waters, gas cap, potential energy of gravitational forces).

At the second stage, secondary methods of maintaining reservoir pressure by injecting water or gas are implemented. These methods are commonly called secondary. At the third stage, tertiary methods of enhanced oil recovery (EOR), which are commonly called modern, are used to improve the efficiency of field development. For the field at the late stage of development, which is Uzen, the use of oil recovery methods is relevant. The method of impact on the formation is selected considering the features of the geological structure, filtration-capacitive properties, the composition of the formation rocks and the fluids that saturate them. This thesis will consider the conditions for the use of hydraulic fracturing in terms of the geological structure of the development target.

This thesis is based on the available geological reports on the production practice of the Uzen field. Materials from additional literature will also be presented.

The purpose of this topic is to study the geological structure of the field, identify the features of the reservoir properties of productive horizons and analyze the effectiveness of the Fracturing method, change in reservoir properties of rocks after fracturing.

The relevance of this topic lies in the fact that Hydraulic Fracturing is the most common methods for increasing oil recovery in the Uzen field, this method on the productive formation has a positive economic effect due to increasing oil recovery.

The main studies are based on the analysis of available geological data on the geological structure of this area and oil and gas potential.

The following studies were carried out during the study: study and analysis of oil and gas content, characteristics of thickness and reservoir properties of productive horizons.



## 1 Overview of the South Mangyshlak basin

The South Mangyshlak oil and gas region is located in the western part of Kazakhstan in the Mangystau region. South Mangyshlak oil and gas region is part of the Mangyshlak-Ustyurt oil and gas basin; controlled by the Mesozoic trough, located in the west of the Turan Plate. The region belongs to the North Caucas-Mangyshlak oil and gas province (Fig.1).

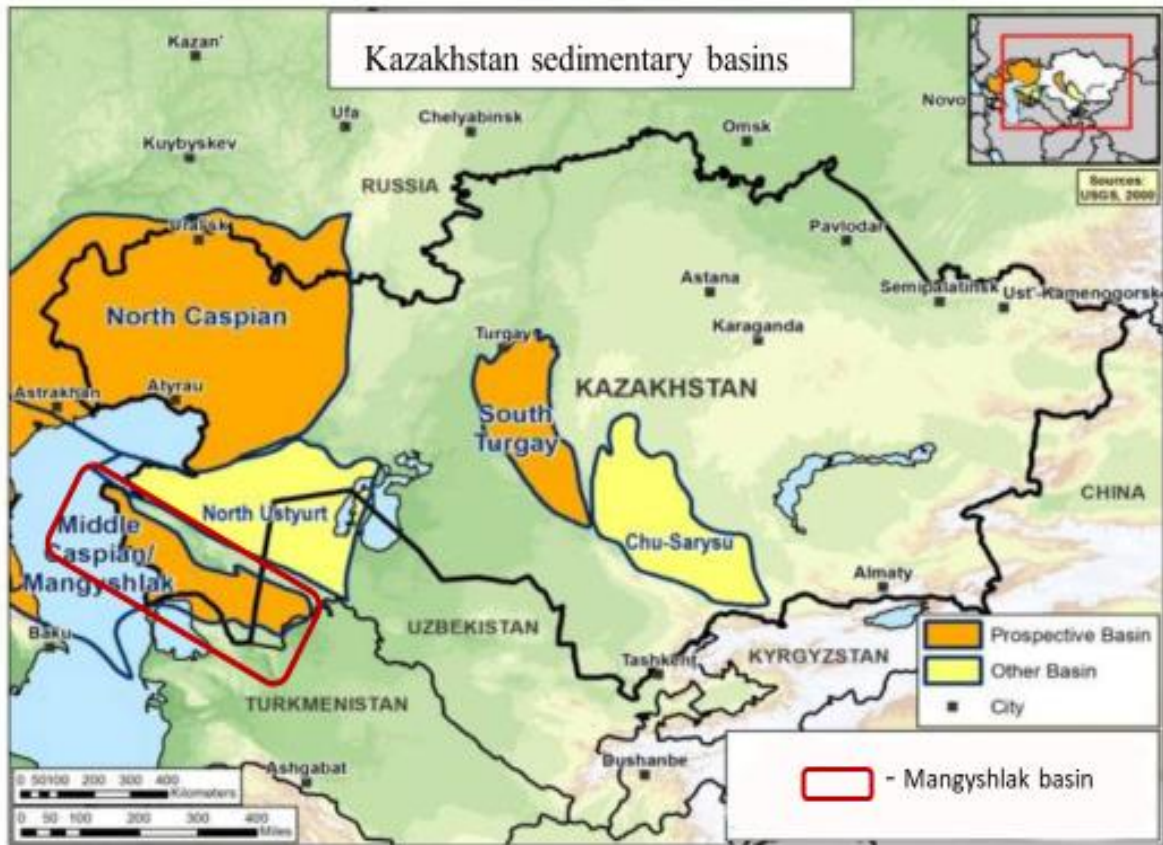


Figure 1 - Overview map of the South Mangyshlak basin

In South Mangyshlak basin shallow core drilling for delineation of surface structures began in 1957 on the Zhetybay step. In 1960 were discovered gas pool in the Uzen field, one of the wells penetrated into a shallow gas pool in the Cretaceous rocks. In 1961, Uzen and Zhetybay, two giant deposits are discovered in the Lower-Middle Jurassic clastic rocks. Then, in 1972 opened a new play in the petroleum system, the first gas and condensate flow were obtained from the Triassic section in the South Zhetybay field. Soon after that, a number of medium and small-sized deposits were found in Triassic rocks in the Peschanomys uplift and the slope of the Karabogaz Arch.

Types of traps are anticline, lithologically shielded. In the Jurassic dominated oil deposits, in the Cretaceous - gas deposits.

## 1.1 Geological structure

The relief of the district is characterized by a complex structure. The central part is densely occupied, located between two drainage-free depressions Uzen and Tunkarakshin. Densely slightly inclined to the south. Maximum absolute elevations (+ 260m) are observed in the northern part, in the south their value does not exceed + 200m. In the west and northwest, the plateau ends in the form of ledges towards the Uzen depression, occupying an area of about 500 km.

The South Mangyshlak oil and gas region is a vast area of trough. At all stages of geological development, this area experienced a long and stable deflection, compensated by the accumulation of thick strata of sedimentary rocks. It was in this environment that the conditions favorable for the disposal and conversion of the starting organic matter into bitumen and the formation of oil and gas accumulations developed. Currently available geological materials indicate that different areas of this territory differ in their degree of perspective.

## 1.2 Tectonic

South Mangyshlak basin tectonically divided into three zones: Mangyshlak uplift system, South Mangyshlak depression and Karabogaz zone (Fig.2).

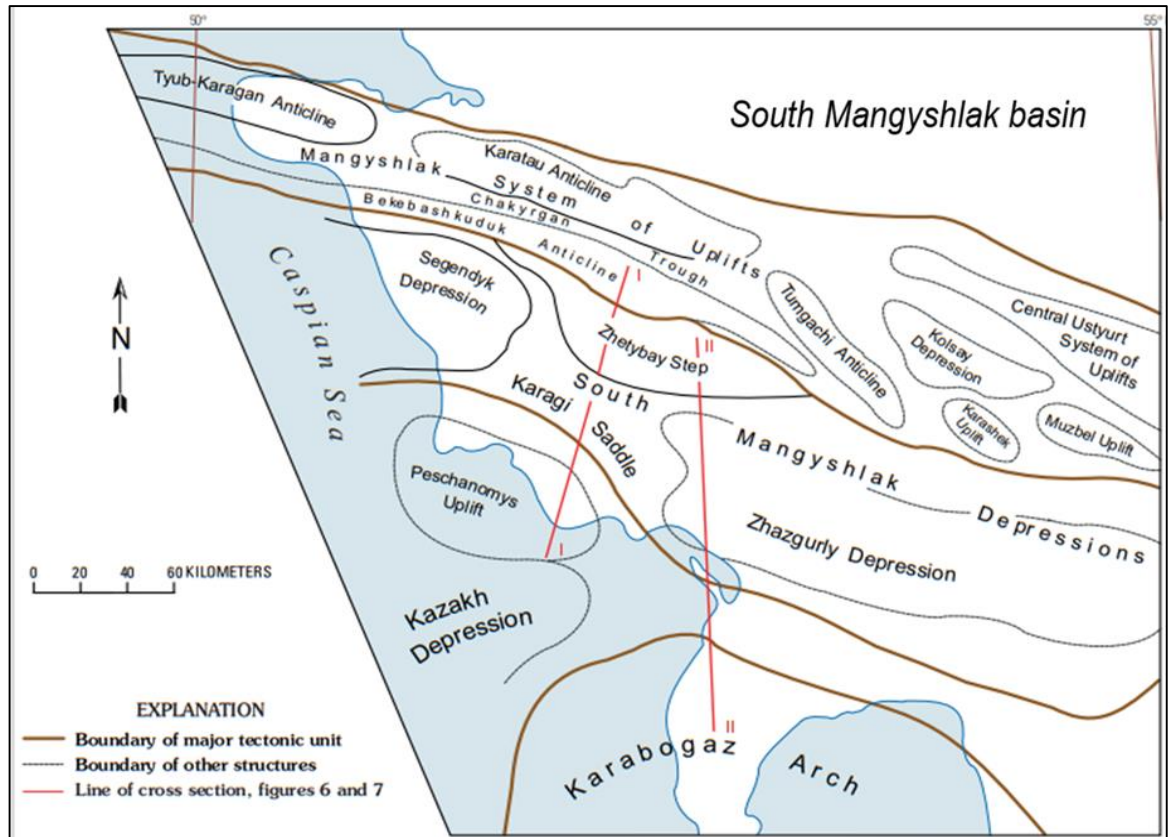


Figure 2 - Tectonic scheme of the South Mangyshlak basin

South Mangyshlak depression includes the Segendyk and Zhazgurlinsky troughs, dividing them the Karaginskaya saddle and the structural terrace located on the northern side of the Zhetybai-Uzen step.

The Segendyk trough, like other troughs of this zone, is asymmetric. It has a steep north side and is more gentle - south. The north side is complicated by a rupture, the south side is supposedly ruptured.

The largest trough of the South Mangyshlak is Zhazgurlinsky. It is located east of Segendykysky south of the Zhetybai-Uzen structural terrace. This trough, like Segendyk, is sharply asymmetric with a steep north and gentle south side. A fault runs along the north side of the trough, expressed in a sedimentary cover by a steep flexure. The depth of deflection along the bottom of the Lower Cretaceous deposits is about 3000 m.

To the north of the deflection described above is the Zhetybay-Uzen step - a narrow, extended structure complicated by a series of relatively large local uplifts, the dimensions of which along a long axis reach 20-25 km. The largest of them - Zhetybay, Uzen and others - are industrially oil and gas. From the north and south, this structural stage is limited by extended tectonic faults. To the west, the Zhetybay-Uzen structural step loses clear boundaries and merges with the Karagin saddle separating the Segendyk and Zhazgurlin troughs.

To the north of the South Mangyshlak trough zone, in the Central Mangyshlak region, there is a large linear structure - the Mangyshlak uplift system. This difficult-to-build zone has a sub-latitudinal stretch of more than 500 km with a maximum width of 60-70 km. The entire Mangyshlak uplift system corresponds to the most submerged part of the Manychsko-Mangyshlak fault system in the Permian-Triassic time. Within the Mangyshlak uplift system, mainly Mesozoic deposits are developed, and to a lesser extent, Paleogene and Neogene rocks, which perform mainly deflections.

The largest and clearest tectonic element complicating the northern part of the system is the Karatau swell. This is a narrow linearly elongated structure about 300 km long and about 200 km wide. There are Permian-Triassic deposits in the most elevated part of the swell, which make up the Karatau swell.

From the south, the Karatau swell borders on the Chakyrgan trough, made of paleogene deposits and having an amplitude along the bottom of this complex of about 100-150 m. In the east, the Chakyrgan trough spreads in the zone of closure of the Karatau swell and other structural elements.

### **1.3 Lithology**

#### Triassic system (T)

Lower-middle Triassic deposits are represented by carbonate rocks, tuffs, tufa-sandstones, vulcanized rocks.

In South Mangyshlak, Upper Triassic rocks were penetrated by wells in Zhetybay, Uzen, Tenga, Tasbulat, Shalabay and other areas. They are represented by alternating black dense strongly limestone-mudstones, dark gray bituminous

siltstones, light gray and dark gray massive or layered marls, light gray porous strong massive limestones and shales.

#### Jurassic system (J)

Jurassic deposits are represented by all three series. On the territory of Mangyshlak, it was possible to find the following stratigraphic series: The Lower Jurassic, the Middle Jurassic (Aalenian, Bajocian, Bathonian stages), the Upper Jurassic (Callovian, Oxfordian, Kimmeridgian stages).

In the Lower Jurassic, they are represented by a thickness of clays, dark gray and gray, very dense, sometimes sandy; siltstones are gray, poorly sorted and sandstones of gray, dense, fine and medium grained.

Middle Jurassic deposits are represented by all three stages: Aalenian, Bajocian and Bathonian.

Deposits of Aalenian age are represented by a layer of gritstones interbedded with sandstones, siltstones and clays. Sandstones have a whitish appearance, since kaolinization processes are widely developed in the thickness. The presence of a large number of gravelites is apparently due to the presence of a break in sedimentation at the border of the Lower and Middle Jurassic.

The deposits of the Bajocian and Bathonian stages are represented by a layer of gray colored terrigenous rocks of sand-silt-clay composition. The thickness is generally continental, but there are interbeds of sediments of marine origin.

Upper Jurassic deposits are represented by the Callovian, Oxfordian and Kimmeridgian stages.

Deposits of Callovian age are represented by two strata of different lithological composition. In the Uzen field exploration area, the Lower and Middle Callovian deposits are represented by a clay layer with sandstone siltstone interbeds. Sandstones are relatively rare, replaced in places by siltstones. Some wells have marl interbeds.

The deposits of the Oxfordian stage are represented by a sequence of highly limestone clays and clay limestones. In the lower part of the stratum there is an interbedded limestone sandstone. The age of precipitation is established by foraminifera.

Kimmeridgian stage is found everywhere, with the exception of Uzen field. The presence of Kimmeridgian has been proven faunistic. From the Peschanomysky block, where Kimmeridgian is represented by carbonate rocks, carbonate rocks are replaced by terrigenous rocks in the north-east direction.

#### Cretaceous system (C)

Lower Cretaceous deposits penetrated by numerous wells within the Uzen, Zhetybay, Zhaga, and Karagie areas are represented by marine and partly continental sediments composed mainly of siltstones, clays, sandstones, and rarely limestones. In the Lower Cretaceous section, the Valanginian and Hauterivian, Kugusemian, Aptian and Albian stages are characterized.

Upper Cretaceous deposits are widespread in the Mangyshlak oil and gas region. In the territory of the Upper Cretaceous deposits are represented by a complete series of sediments from the Cenomanian to the Danish stage. The Lower

Cretaceous, terrigenous complex, composed of sand-clay rocks, limestone in age to the Cenomanian - the Lower Turonian.

#### Paleogene System (P)

Paleogene deposits include the Eocene and Oligocene series. The Eocene section is represented by marls and limestones with interbeds of clays. The Oligocene section is represented by a uniform thickness of gray and light gray clays.

#### Neogene System (N)

Neogene deposits are represented by Tortonian and Sarmatian stages. The Tortonian stage is represented by a thickness of clays, marls, sandstones and limestones. The sedimentation of the Sarmatian stage is represented by interbedding of limestones, marls and clays.

#### Quaternary system (Q)

Quaternary deposits are represented by loams, sands, clays of euvial-demovial origin. Sediment thicknesses up to 5-7 meters.

### **1.4 Oil and Gas Content**

In South Mangyshlak, productive oil and gas horizons have been identified in the Paleozoic, Triassic, Jurassic and Cretaceous deposits, which are considered as an independent oil and gas contour. The identified oil reservoirs are concentrated in four oil and gas regions: Zhetybay-Uzen, Peschanomysk-Rakushechnoe, Dunginsky and Tyubkaragan.

The South Mangyshlak region contains most of Kazakhstan's fields, such as Uzen, Zhetybay, Tubejic, Rakushechnoe, Oimasha, Karamandybas, Tasbulat, Alatube etc (Fig.3).

In the basin fields, oil was found at a depth of over 150 meters (Zhanurshi) and over 4000 meters (Rakushechnoye). South Mangyshlak oil is highly paraffinic, in the Tasbolat field 36.7%. The Oymasha field, which differs in the basin, produces oil from carbonate reservoirs in this field. It was discovered in 1980. The upper part of weathered granites of coal age, terrigenous-carbonate strata of the Middle Triassic and sandstones of the Lower Jurassic were proved.

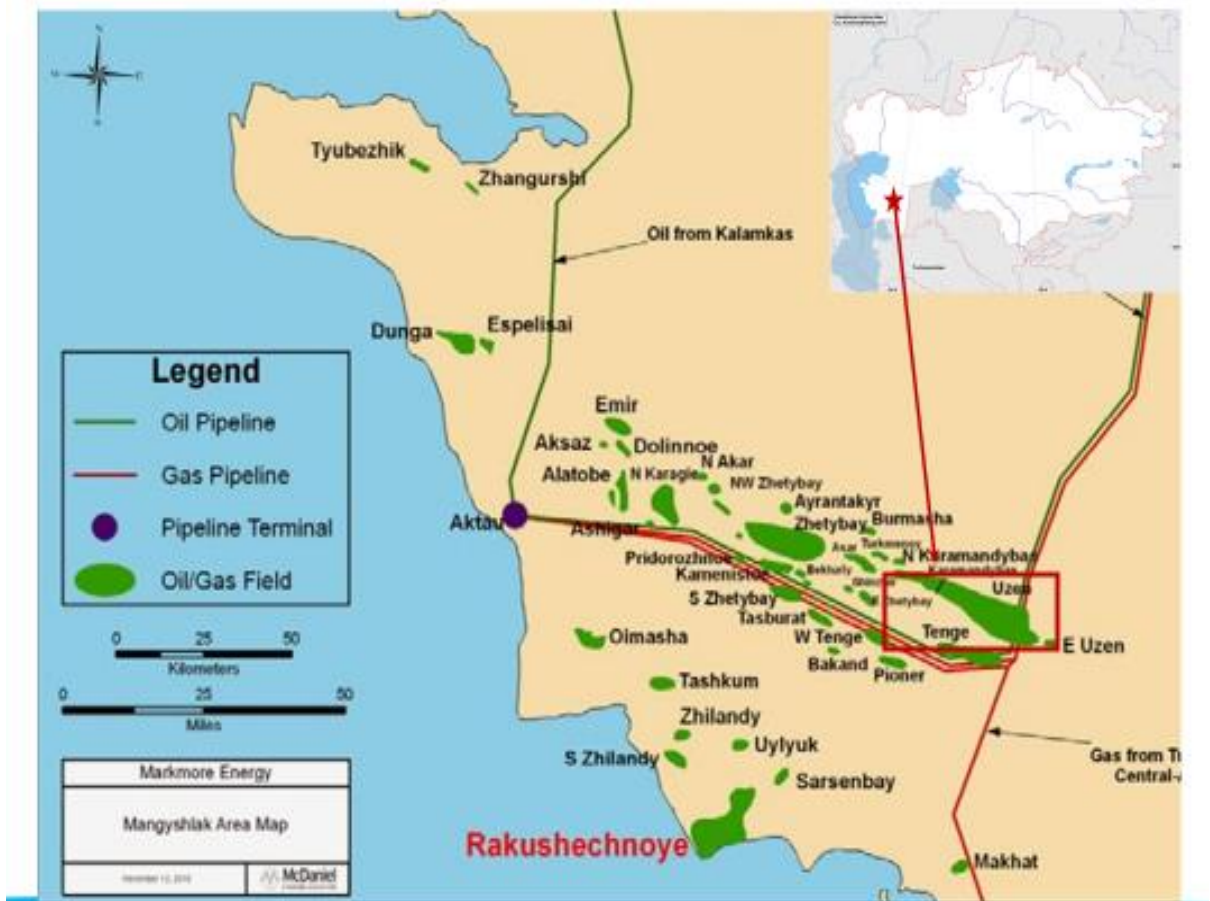


Figure 3 - Overview map of major fields of the South Mangyshlak basin

## 2 Overview of the Uzen field

The Uzen oil field was discovered in the Mangyshlak region of Western Kazakhstan in 1961. The dimensions of the structure along the top of the Jurassic productive horizons are 33 x 10 km with an amplitude of up to 300 m. The Karamandybas and Tenge oil and gas fields are located in the immediate vicinity of the Uzen field (Fig.4).

Economically, the region developed due to oil and gas fields, discovered in 1961. Currently, there is a large oil and gas production department of “Uzenmunaigas” JSC, a gas processing plant.

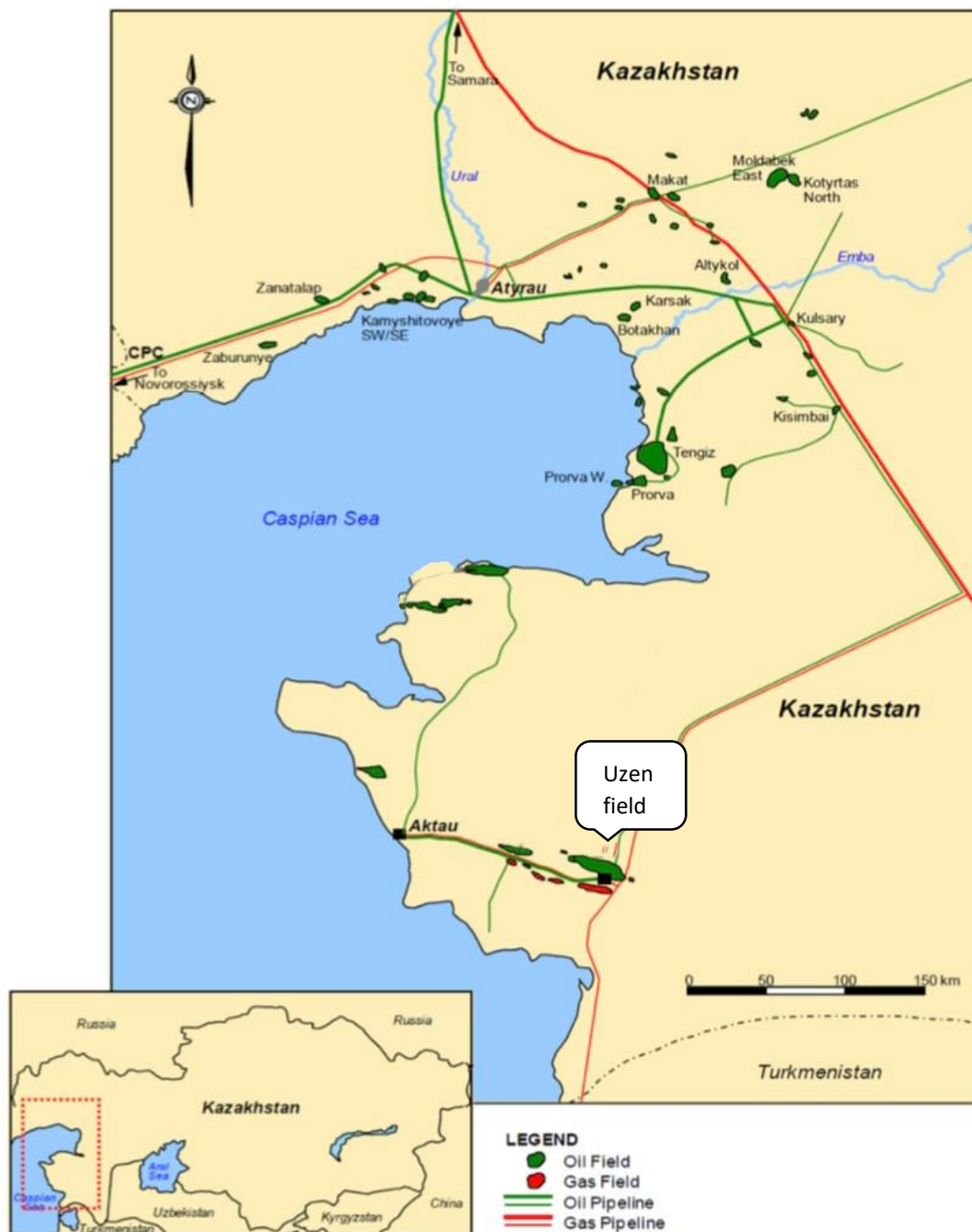


Figure 4 - Overview map of the Uzen field

## 2.1 Geological structure

The complexity of the geological structure of the field is due to the large number of productive zones, the different phase state of the reservoirs, the presence of tectonic disturbances, the lack of retention in the area and section, and the lithological variability of the reservoirs in the intervals of the Middle Jurassic productive layers.

The Uzen structure is complicated by five domes, most clearly traced by the lower productive horizons: The main arch, the Humurun, North-Western, Parsumurun and East Parsumurun domes (Fig.5).

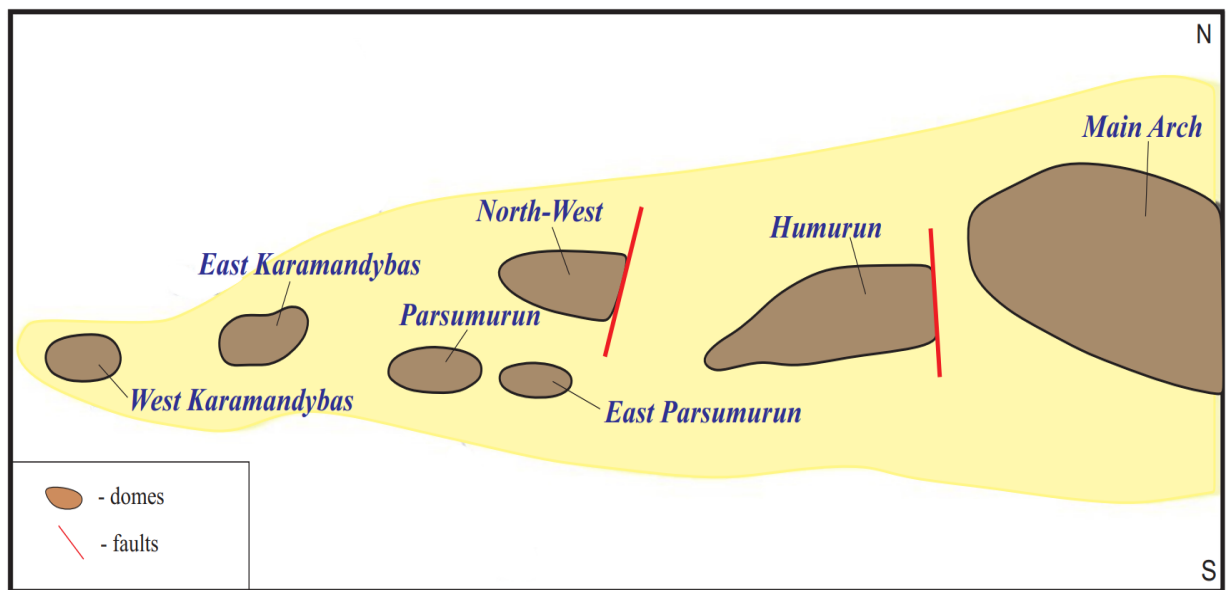


Figure 5 - Uzen field's five domes

In the geological history of the stage, three structural floors are distinguished, separating from each other by regional stratigraphic and angular unconformities: geosynclinal (pre-high Paleozoic), transitional (Permian-Triassic) and platform (Jurassic-Anthropogenic).

## 2.2 Tectonic

Tectonically, the structures of the Uzen-Karamandybas field are confined to the Zhetybay-Uzen tectonic step (Fig.2).

The Zhetybay-Uzen tectonic step is a structural element of the second order, is confined to the northern side of the South Mangyshlak trough and stretches from northwest to southeast for 200 km with a step width of about 40 km.

The Uzen structure is a large asymmetric anticlinal fold of almost latitudinal rubbing. The south wing is larger than the north wing. The highest elevation of the bottom surface of the horizon is 854.6 m, the low absolute elevation on the southern wing is 1206.6 m, on the northern wing is 1165.2 m. The amplitude of the fold rise is 300-350 m. In the area between wells 57-61, according to seismic data, a saddle-



shaped, small-amplitude deflection separating the Uzen axis of Karamandybas is outlined. Despite the fact that the arch of the structure has been significantly refined, the western perclinal immersion remains poorly studied.

### **2.3 Lithology**

In Uzen field, there is a section including Triassic, Jurassic, Cretaceous, and Quaternary deposits with a maximum penetrated thickness of 4500m (Well. №115) (Fig.6).

Triassic deposits are represented only by the lower section (Induan and Olenekian tiers), which is dominated by red-colored big grained tuff-terrigenous rocks (sandstones, tuff-sandstones, siltstones) and variegated siltstone-mudstone strata composed of mudstones with tuff interlayers, siltstones, tuff-siltstones. The Lower Triassic deposits with thickness from 698 (well 117) to 2250 m (well 115) were penetrated by deep drilling in the Uzen structure.

The Jurassic deposits associated with the commercial oil and gas content of the Uzen field are transgressive on the eroded surface of the Triassic complex of rocks. As part of the Jurassic period, according to the results of the study of fauna, flora and data from log analysis, the lower, middle and upper sections are distinguished. In terms of lithological composition, Jurassic deposits are clearly divided into two complexes: the terrigenous complex of rocks of the Lower, Middle Jurassic and the carbonate complex of the Upper Jurassic. The undivided deposits of the Lower Jurassic are represented by interbedded sandstones, siltstones, mudstone-like black coal clays with organic plant remains (OPR) and coal inclusions. Middle Jurassic deposits are represented by continental, coastal - marine and marine formations. As a result of palynological study, deposits of the Aalenian, Bajocian, Bathonian and Callovian stages are distinguished as part of the Middle Jurassic.

On the eroded surface of the Jurassic complex of rocks lies a layer of Cretaceous deposits. In the section of Cretaceous, the lower and upper sections are distinguished. According to lithological characteristics, the Upper Cretaceous is clearly divided into two parts: the lower terrigenous and the upper mainly chalk-marl.

In the Uzen structure, two sections of the Paleogene system are distinguished - Eocene and Oligocene.

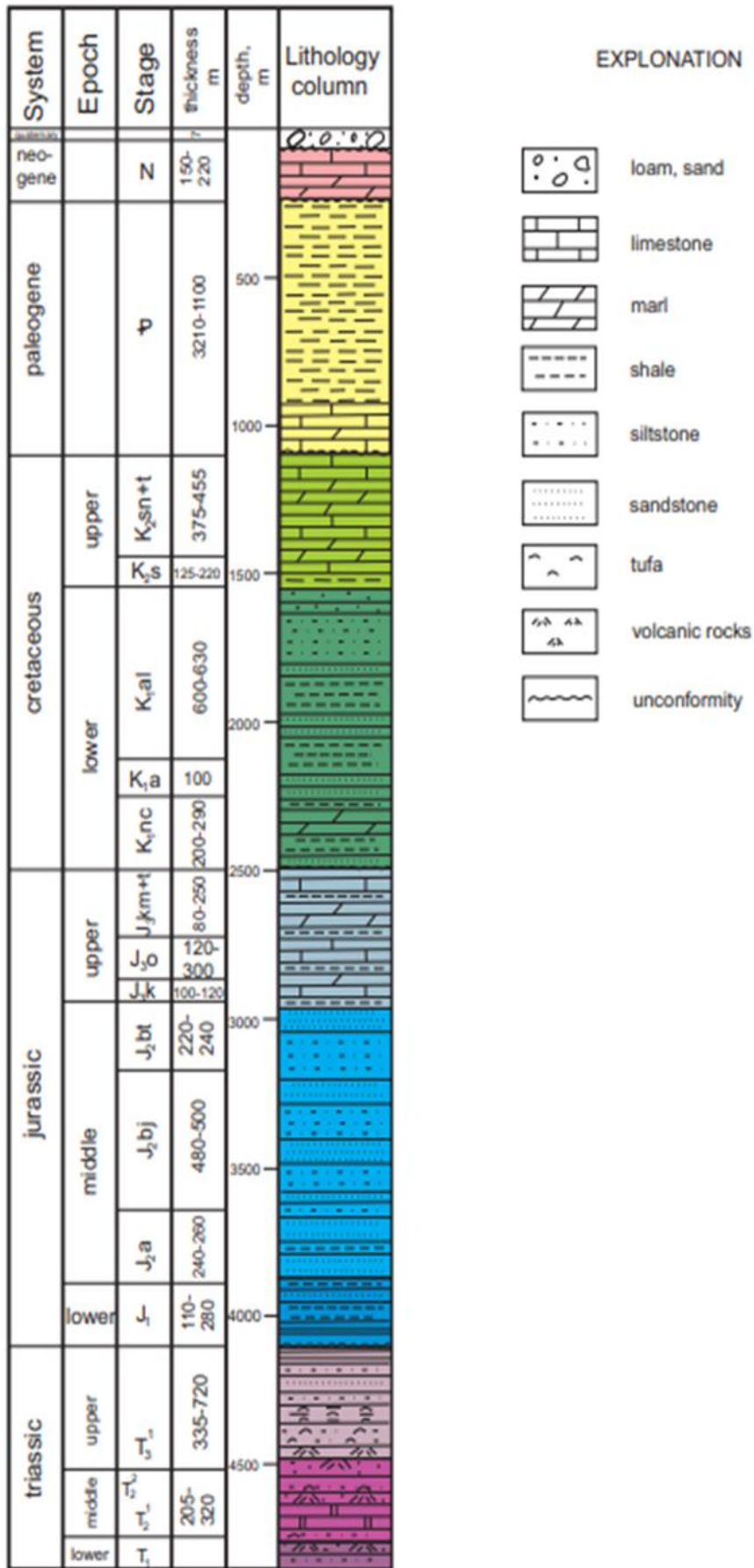


Figure 6 – Uzen field’s stratigraphic column

## 2.4 Oil and Gas Content

The oil and gas content of the field was established in the Jurassic deposits, where 12 productive horizons were identified (from horizons 13 to 24). 6 horizons (13, 14, 15, 16, 17, 18) were identified on the upper floor of the oil and gas content of the Uzen field: 13 productive horizons, stratigraphically belongs to the Callovian tier of the Middle Jurassic, 14, 15 and 16 productive horizons, confined to the Bathonian tier of the Middle Jurassic, 17 and 18 productive horizons - belongs to the Bajothian tier of the Middle Jurassic.

6 horizons (19, 20, 21, 22, 23, 24) were identified on the lower floor of the oil and gas content of the Uzen field. Deposits of the 19-24 horizons of the field are terrigenous continental and lagoon-continental Middle Jurassic formations of the Bajothian and Aalenian tiers. Productive deposits are represented by uneven alternation of sandstones, siltstones, clays and lithological differences between them. Among them there are thin interbeds of limestones, marls, siderite, coals, accumulations of charred plant detritus.

By the nature of saturation, mainly oil deposits and only six deposits have gas caps, two deposits on the Main Vault, two deposits on the Khumurun and two on the Parsumurun domes.

The hydrocarbon deposits of the Jurassic zones are classified as formation, arch, and tectonically shielded by type.

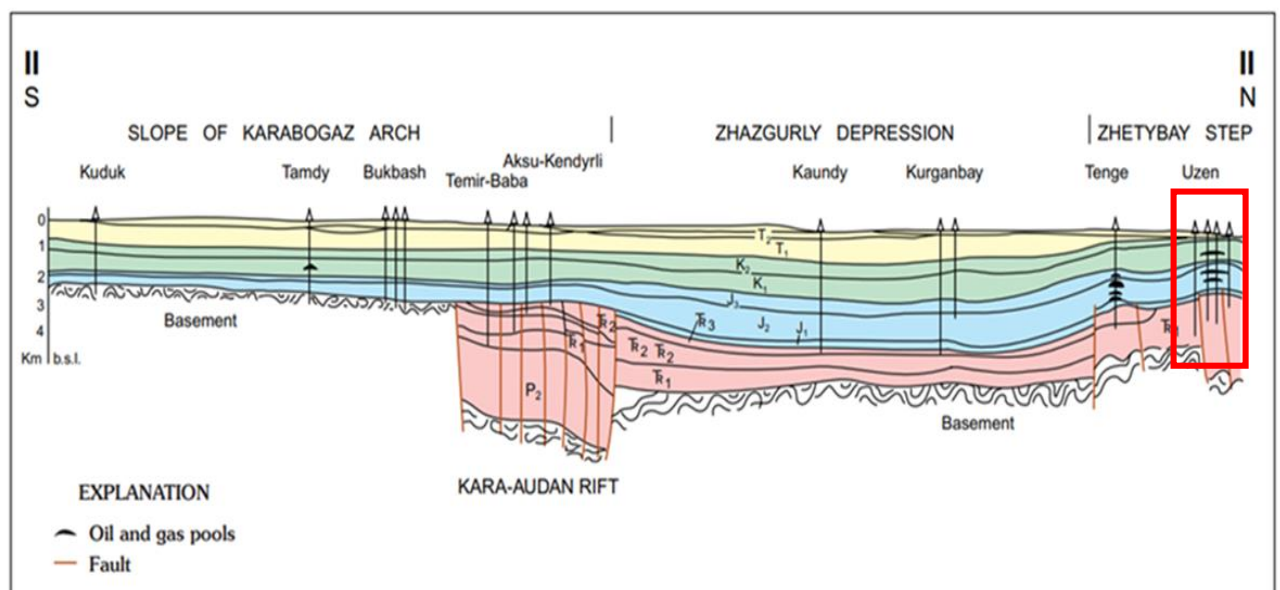


Figure 7 - Cross section through South Mangyshlak petroleum system (II-II)

### **3 Main part**

#### **3.1 Filtration-capacitive properties of rocks before HF**

##### **3.1.1 Brief description of the Hydraulic fracturing method**

Every year hydrocarbons extracted from the subsoil become less and less accessible. The proportion of reservoirs with good filtration-capacitive properties decreases. When developing unconventional reservoirs and reservoirs with poor reservoir properties, various methods of increasing oil recovery are used.

One of the most common is hydraulic fracturing.

Hydraulic fracturing has been used at the Uzen field since 2003 to increase well productivity and increase oil recovery by involving poorly drained zones and interbeds in active development.

The essence of hydraulic fracturing consists in injection of viscous fluid under high pressure into the bottom hole zone of the formation, as a result of which new fractures form in the rock and existing ones expand. Permeability in the bottom hole zone increases dramatically and, consequently, the inflow of fluid into the well increases. In order to prevent the fractures from closing after the discharge pressure is removed, a fixing agent is pumped together with the liquid. As a rule, fracturing is carried out in inclined wells, or in wells with a horizontal end. At Uzen field it is carried out in wells with horizontal termination. This condition is necessary for a larger area of contact between the wellbore and the reservoir formation.

There are several varieties of fracturing:

- Propane fracturing - hydrofracturing using propane that is injected during fracturing to prevent the fracture from closing. As a rule, this type of frac is used in terrigenous reservoirs.

- Acid fracturing - hydraulic fracturing in which acid is used as the fracturing fluid. It is used in carbonate reservoirs. A network of cracks and cavities created with acid and high pressure does not require proppant fixation. It differs from conventional acid treatment by a much larger volume of acid used and injection pressure.

The field uses propane with a density of 2.7-3.3 g/cm<sup>3</sup>. The transfer and location of proppant along the fracture determines the size of the fractures. Given the wedge-like nature of the fractures gradually expanding towards the wellbore, the propane of the small fractures is first injected and then the larger fractures are injected.

Fracturing conditions:

- sufficient effective thickness (at least 5 m);
- sufficient thickness of impermeable sections (more than 8 m);
- sufficient distance to GOC and OWC;
- low reservoir separation;
- low permeability of the formation.

### 3.1.2 Reservoir properties of productive horizons

A set of profile and standard core studies is performed in the Uzen field to study lithological, physical, and reservoir properties, including spectral gamma scanning, scanning the core with a computed tomograph to study the void space photographing, macroscopic description of full-length core and samples, computed tomography, determination of oil-water saturation, mineralogical and bulk density, open porosity, gas permeability, particle size distribution and carbonate content, microscopic examination of the sections and examination of the samples by a scanning microscope.

As mentioned above, 12 productive horizons were identified in the Uzen field - from 13 to 24. The diagrams show data on reservoir properties of rocks from horizons 13 to 24 of the Parsumurn Dome.

Permeability values are determined for all reservoirs. The maximum average permeability from log data is observed in 21 horizons (703 mD) (Fig.8).

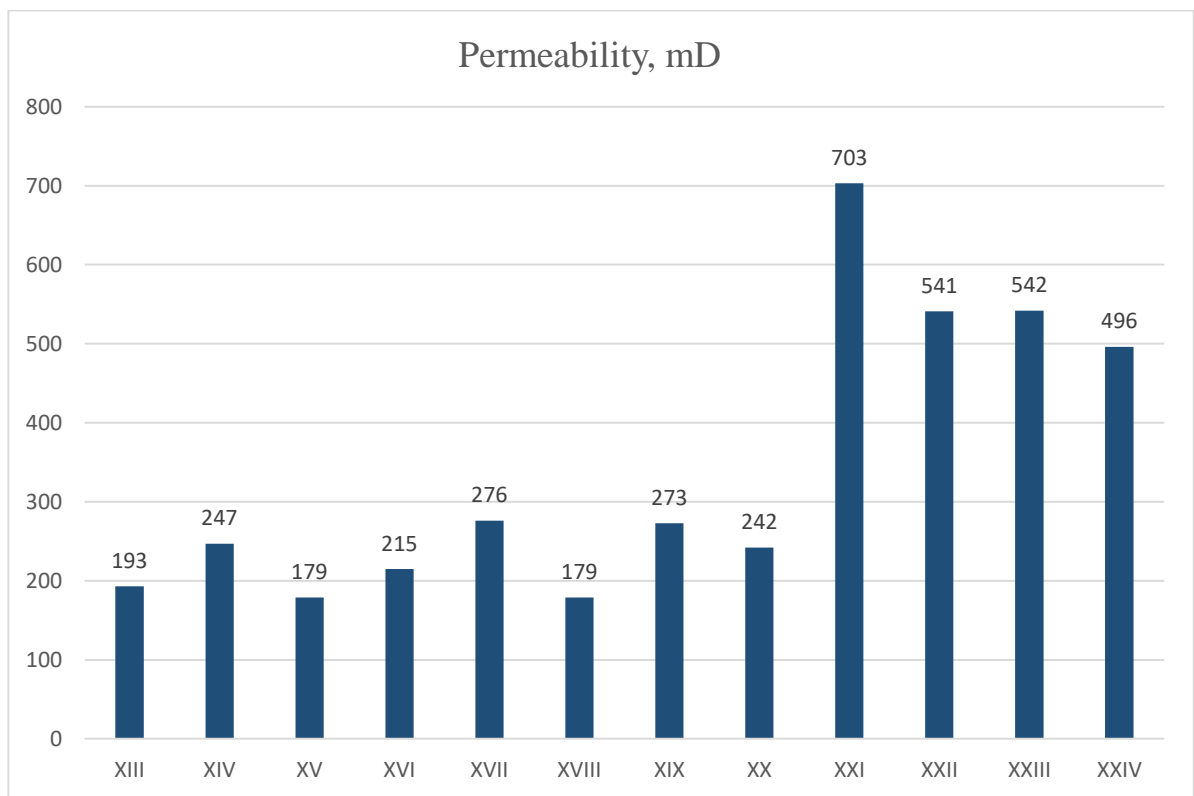


Figure 8 - Permeability of productive horizons of Parsumurun dome

The reservoir properties of the reservoir were determined both from laboratory core data and from interpretation of field geophysical material. The figure shows that the average porosity varies from 18% to 27%, with a maximum porosity of 13 horizons (Fig.9).

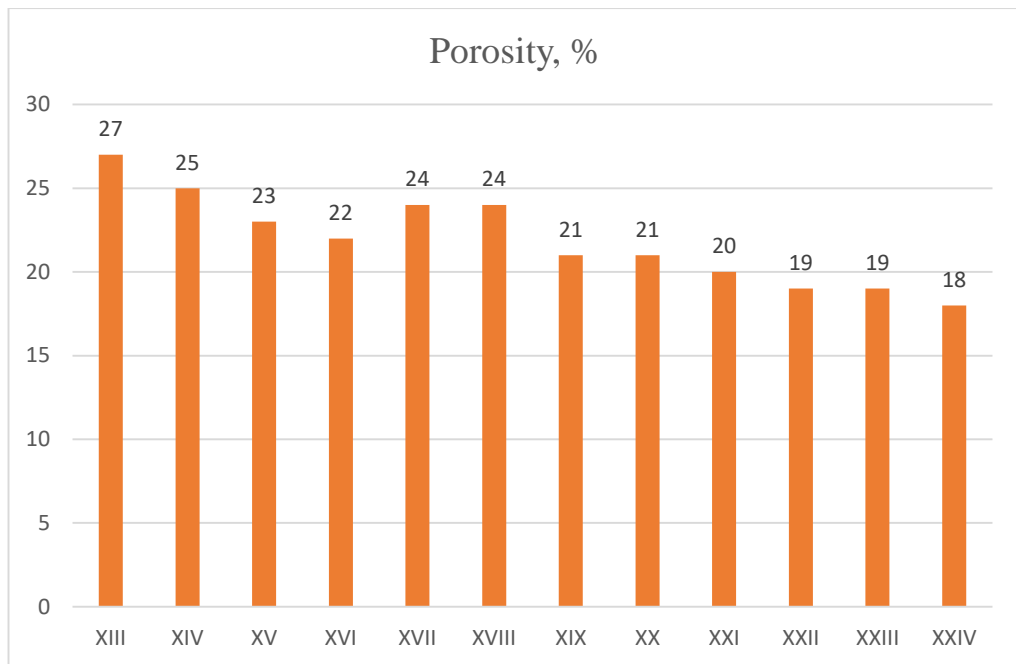


Figure 9 - Porosity of productive horizons of Parsumurun dome

Average net pay thicknesses range from 7.8 m in horizon 13 to 24.5 m in horizon 20 (Fig.10).

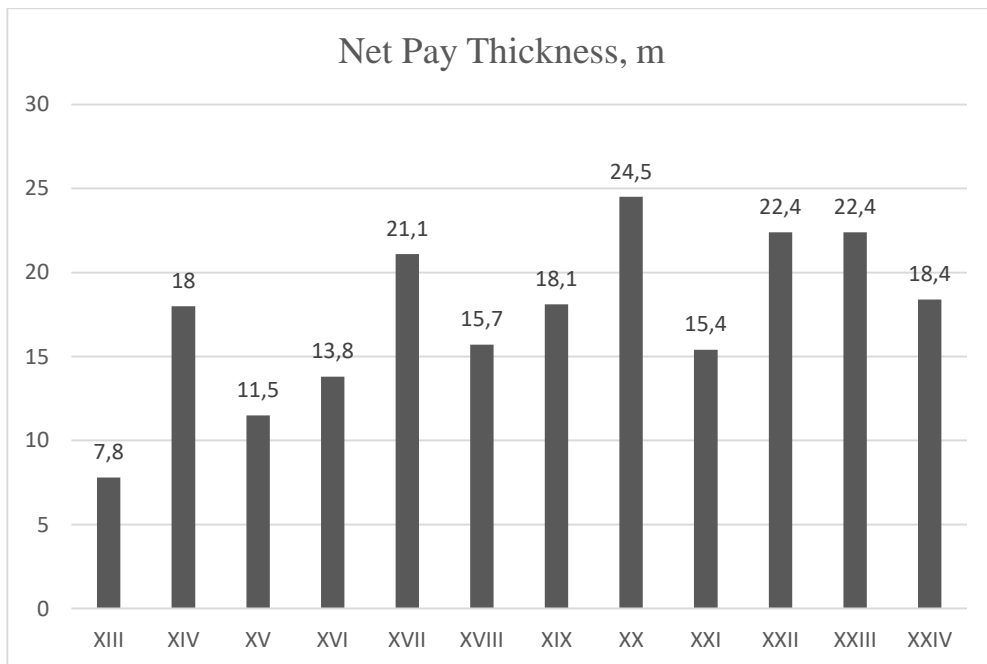


Figure 10 - Net Pay Thickness of productive horizons of Parsumurun dome

The 14th horizon of the Parsumurun Dome was considered to analyze the impact of geological factors on the efficiency of fracking. This analysis was performed on 3 production wells (Fig.11).

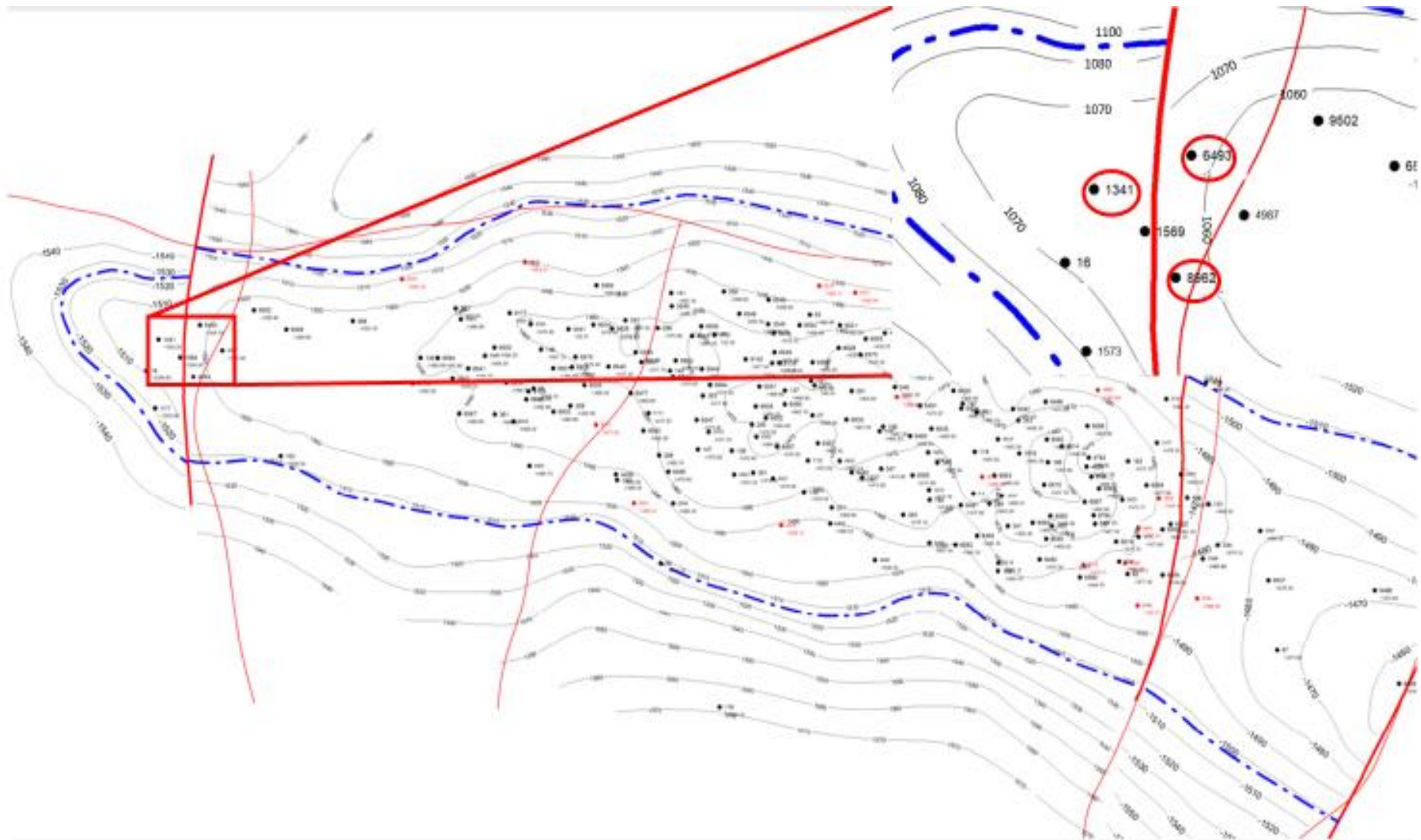


Figure 11 - Structural Map of Horizon 14 of the Parsumurun Dome (Well Location for Analysis)

### 3.1.3 Geological factors on fracturing

Geological factors have a major impact on frac performance. Accounting for their influence is quite complicated.

Prior to fracturing, a qualitative study of the development site should be carried out, which includes:

- drilling exploration and exploration wells;
- core sampling of rock in which fracturing will be carried out and rock - fluid seals;
- laboratory studies of core samples (determination of reservoir properties and physical properties);
- well logging;
- construction of correlation schemes;
- map, profiles, sections (interpolation and extrapolation)

The following parameters were considered for the analysis: permeability, porosity, net pay thickness, productivity index.

Average reservoir porosity and permeability values (filtration-capacitive properties): porosity factor - 0.20 units, permeability factor - 8.29 mD. Effective oil-saturated thicknesses vary from 15.4 m to 26.8 m.

Table 1 - Filtration-capacitive properties of wells at the time of hydraulic fracturing.

№ well	Permeability, mD	Porosity, %	Net Pay Thickness, m
1341	9,21	20	15,4
6493	8,16	20	22,4
8952	7,51	20	26,8

As we can see in Table 1, all parameters correspond to the average values for fracking. In the Uzen field, hydraulic fracturing is used in formations with permeability from 10 to 15 m D. In the analyzed wells, permeability varies from 7.51 m D (well 1399) to 9.21 m D (well 8109).

In order to perform fracturing, the well process parameters must also be considered. The water cut at the time of hydraulic fracturing should be up to 68%, and the flow rate of oil and liquid before hydraulic fracturing should be at least 3.7 t/day and 73 m<sup>3</sup>/day, respectively.

In all three wells, the water cut is 50%, and the oil and liquid production rate before fracturing varies from 5.3 t/day (Well 8109) to 17.1 t/day (Well 1399) (Table 2).



Table 2 - Technological parameters of wells.

№ well	Water cut, %	Liquid Rate, m <sup>3</sup> /day	Oil Rate, t/day	Productivity Index, m <sup>3</sup> /day/atm
1341	50	12,5	5,3	0,660
6493	50	16,2	6,9	0,851
8952	50	17,1	7,1	0,894

### 3.1.4 Geophysical Well Survey

Prior to fracturing, logging is performed. The main tasks of GWS are:

- control of reserves depletion: determination of the nature of the current saturation of gas, water (at a qualitative level) and determination of the current gas saturation factor (at a quantitative level);
- determination of operational characteristics of formations (operating intervals of the formation, inflow profile and interval flow rates, bottom hole pressure and drawdown on the formation, interformation flows, watered intervals, filtration characteristics of formations and interlayers);
- process monitoring of well operation: static and dynamic levels of fluid in the wellbore, composition of fluid in the string, position of process equipment;
- technical monitoring of the condition of the wells (clarification of the actual design, current bottom hole, tightness control of casing strings, tubing, packers and cement ring, information support of the workover, determination of fluid movement in the string, detection of behind-the-casing gas and water flows);
- quality control of work on intensification of hydrocarbon production. Assessment of the effectiveness of secondary formation penetration; results of intensification of fluid inflow after repeated and additional perforations, hydraulic fracturing of formations; measures to change the technical condition of the well - installation of a cement plug, explosion packers, etc.

To ensure the design of hydraulic fracturing, the following tasks are set before logging: determination of elastic properties of rocks in the interval of upcoming work and identification of intervals of non-uniformity of rocks. In addition, it is necessary to assess the tightness of the annulus and the change in the condition of the cement after fracking.

When selecting the hydraulic fracturing facility and further monitoring its effectiveness, the reservoir performance is studied: determination of the inflow profile, formation pressures, gas and water inflow locations, identification of water-flooded intervals, and identification of the causes of water flooding.

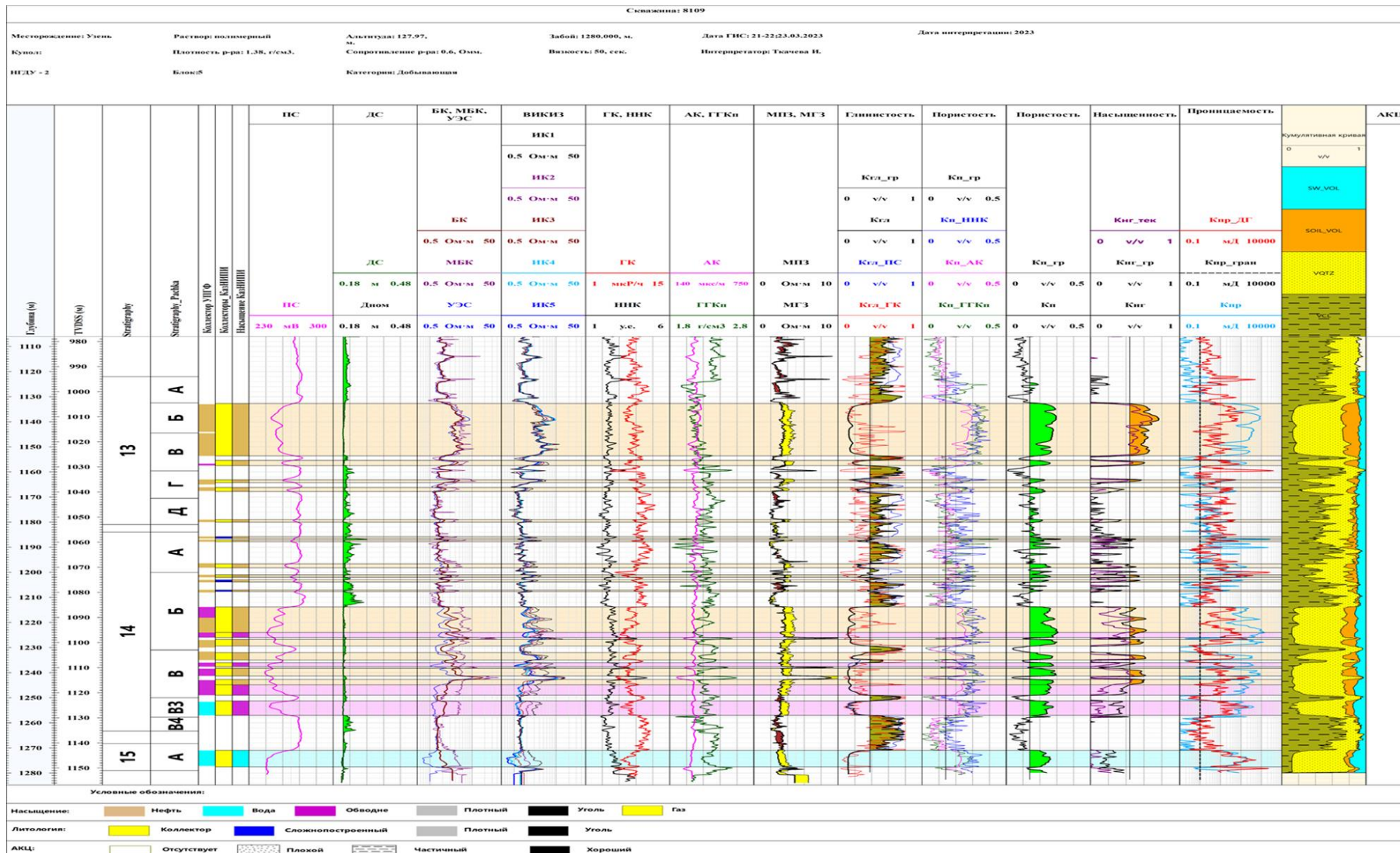


Figure 12 - Well Log 1341

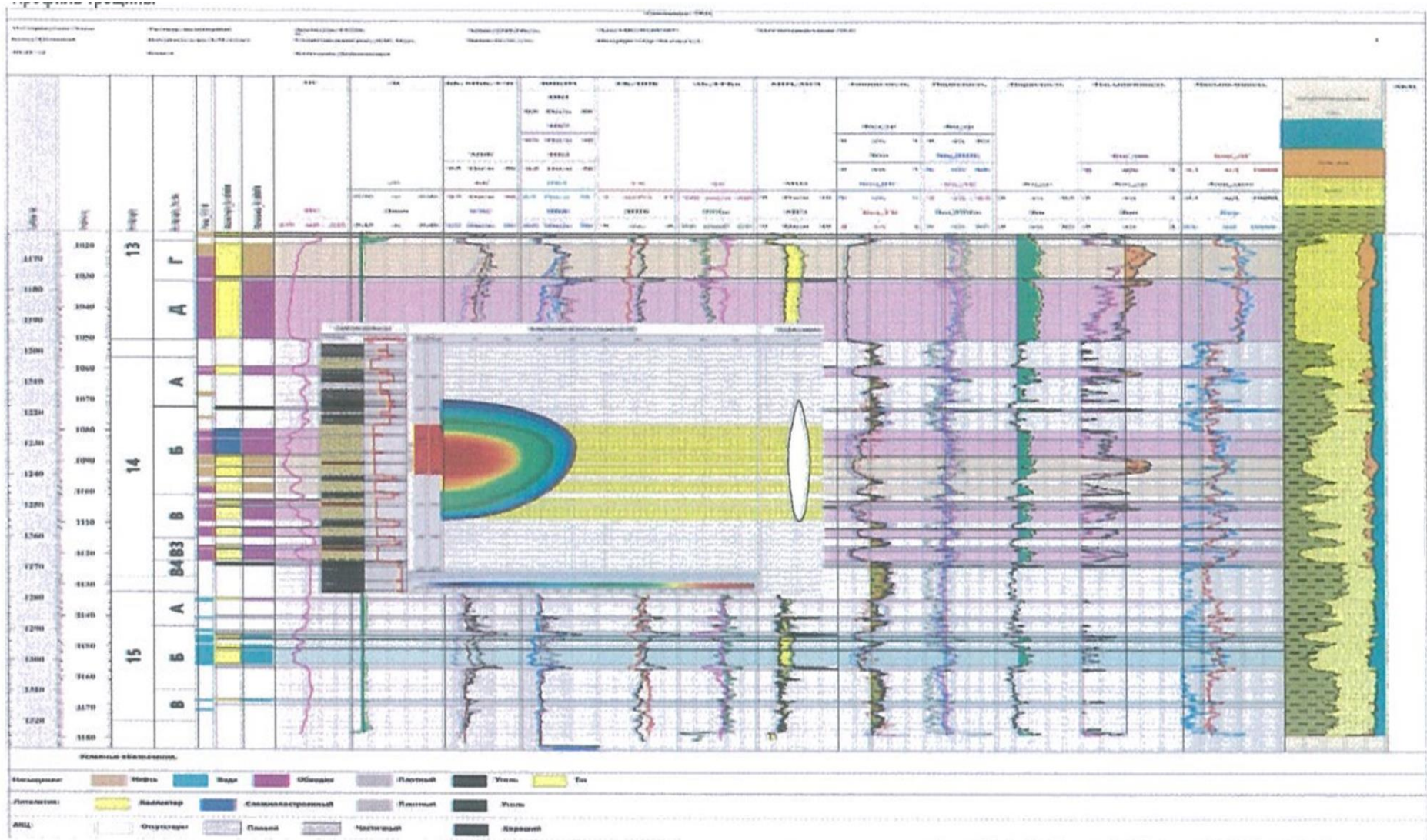


Figure 13 - Well Log 6493 with frac model

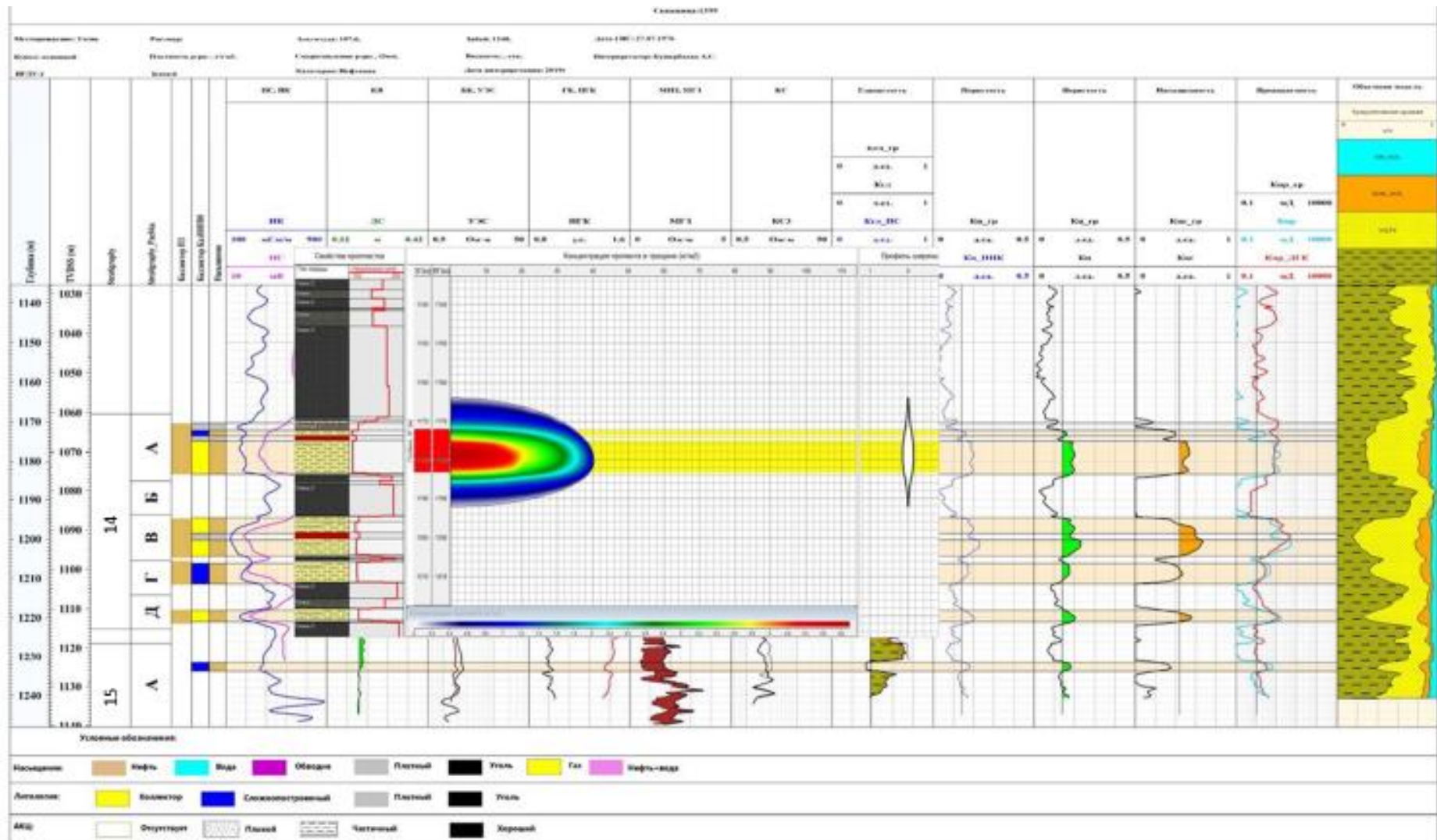


Figure 14 - Well Log 8952 with frac model

### 3.1.5 Perforation

The length of the perforation interval may affect the fracture. For vertical wells, the perforation interval is limited to 15-30 meters. Table 3 shows perforation zones for all wells.

Wells subject to fracturing must be sufficiently distant from the contour of the water-oil and gas-oil contacts, usually at least the distance between the wells. With less separation of the producing well from the oil-bearing contour, its rapid flooding or gas breakthrough from the cap may occur, especially if the direction of the hydraulic fracture is perpendicular to the contour line.

Table 3 - Perforation intervals

1341	Top, m	Bottom, m	6493	Top, m	Bottom, m
1	1196,6	1198,2	1	1225,1	1227,9
2	1201,0	1202,0	2	1228,5	1233,3
3	1203,0	1203,8	3	1233,9	1238,7
4	1207,1	1207,6	4	1237,4	1240,7
5	1213,8	1216,0	8952	Top, m	Bottom, m
6	1217,8	1220,0	1	1172	1184
7	1222,2	1226,0			
8	1227,5	1228,5			

It is known that after perforation, a fracture zone is formed around the channels created in the formation, and the perforation channels themselves can be partially filled with debris. Therefore, it is advisable to perforate the well on a depression, since the perforated channels cleared of debris provide better conditions for injecting process fluids during fracturing.

After perforation, liquid is added to the well. Propane is designed to prevent the fracture from closing after completion of injection. Propane is added to the kill fluid and injected with it. The main factor influencing the end result of a rupture operation is the preservation of a well-opened crack. In order to maintain the permeability created by proppant, a proppant is used. The proppant must provide and maintain a high liquid flow permeability passage toward the wellbore.

### 3.1.6 Fracture

The increase in the productivity of the well after fracturing depends on the ratio of permeabilities of the productive formation and the created fracture and on the dimensions of the latter. During the design of the frac design, the optimal fracture length is determined mainly by the reservoir properties of the pay zone. If in medium and high permeable formations the main factor of increase in well productivity is fracture width, in low permeable formations - its length.

During the frac operation, the uncontrolled nature of the cracks is dangerous. Cracks can propagate in one direction better than in the perpendicular direction. Such a phenomenon can be fraught with the fact that the fractures can spread in the direction up to the OWC for a longer length than along the strike of the formation. The result will be a premature breakthrough of water into the well and untreated areas with oil. If the frac interval is close to the OWC or GOC, there is a risk of water or gas breakthrough through the fracture system. With an insufficiently strong impermeable barrier, the consequence of frac can be the loss of integrity of the fluid stop and the destruction of the trap.

In the investigated wells, the total fracture height ranges from 39 m to 44 m (Table 4). Fracture well 1341 is located 20 m further from the oil zone, and fracture well 6493 is located 25 m further, no oil zone was detected on well 8952 (Figures 12, 13, 14).

Table 4 - Fracture geometry

Well	Half-length of fracture (m)	Total fracture height (m)	Fracture top (m)	Fracture bottom (m)	Maximum fracture width (mm)	Average fracture width (mm)
1341	43	44	1187	1230	6,8	4,8
6493	42	39	1216	1255	7,3	4,9
8952	45	32	1161	1192	2,9	1,9

For the projecting frac uses a frac design is made using special software packages that allow you to consider the lithological features of the reservoir, stress in the formation, azimuth of hydraulic fractures, etc. All this makes it possible to achieve high success during well operations. Modeling of the fracturing process allows obtaining information on the geometric and filtration parameters of the fracture, as well as predicting its effectiveness and correctly applying this technology in certain geological and physical conditions (Fig.15, 16, 17).

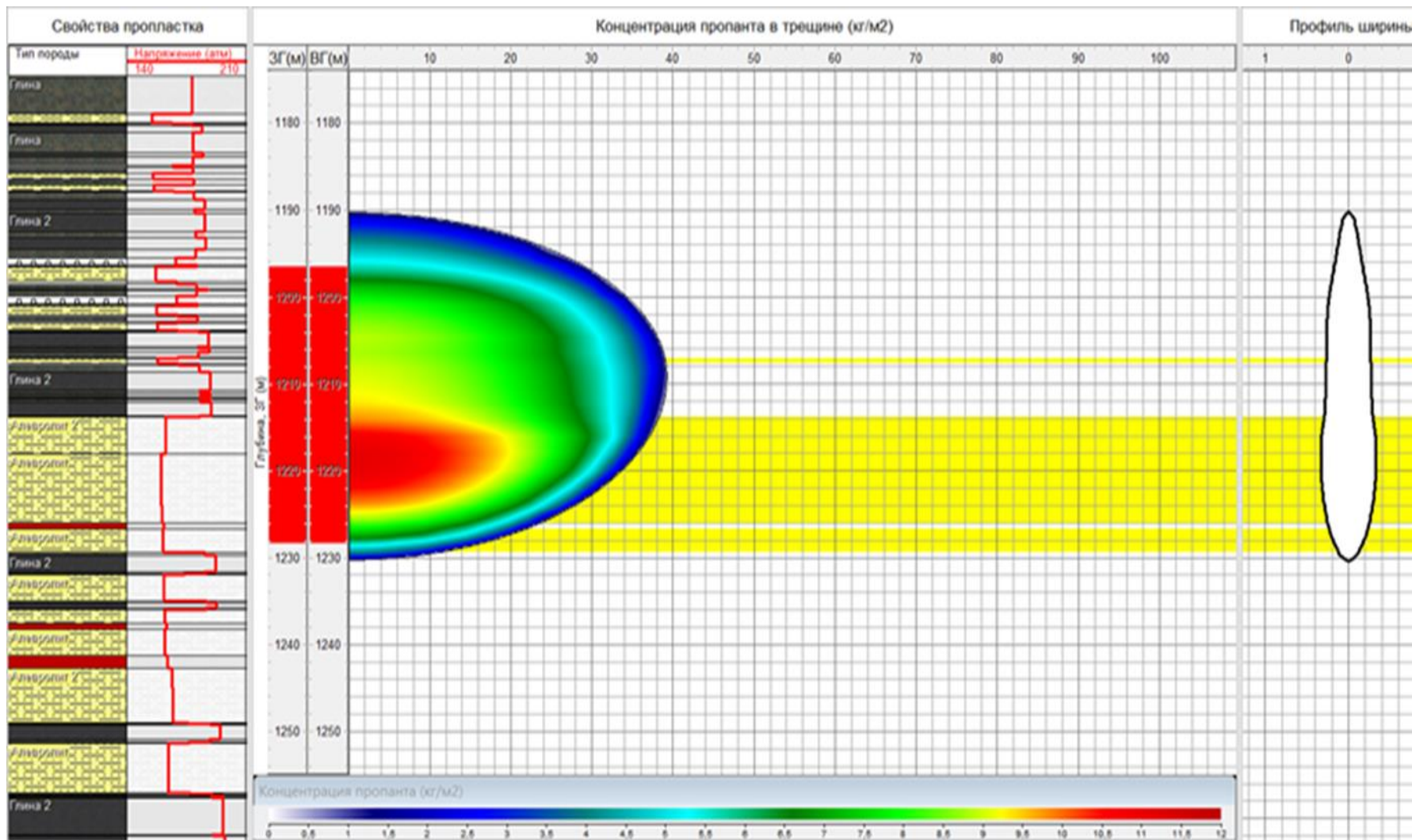


Figure 15 - Fracture profile of well 1341

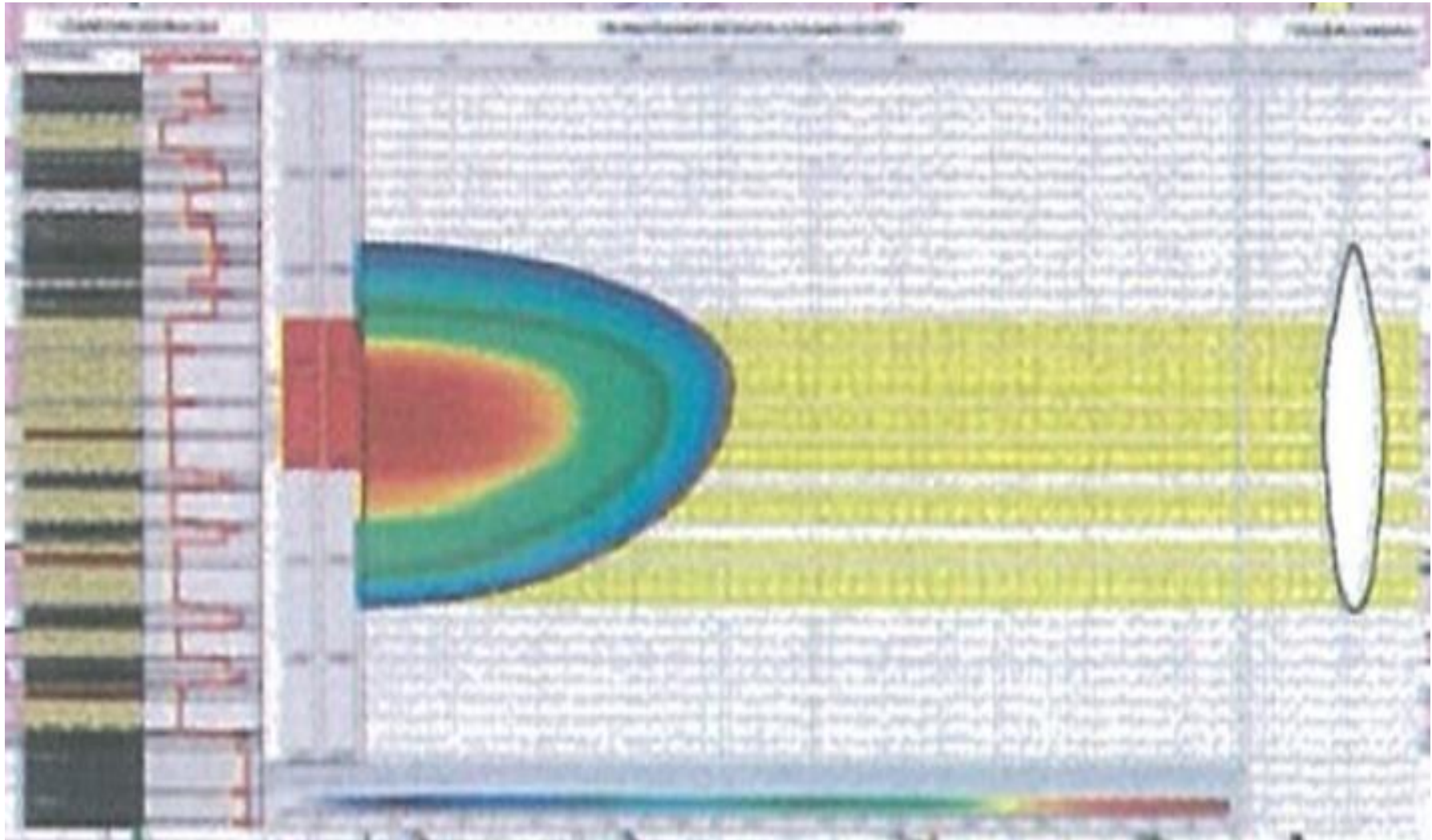


Figure 16 - Fracture profile of well 6493



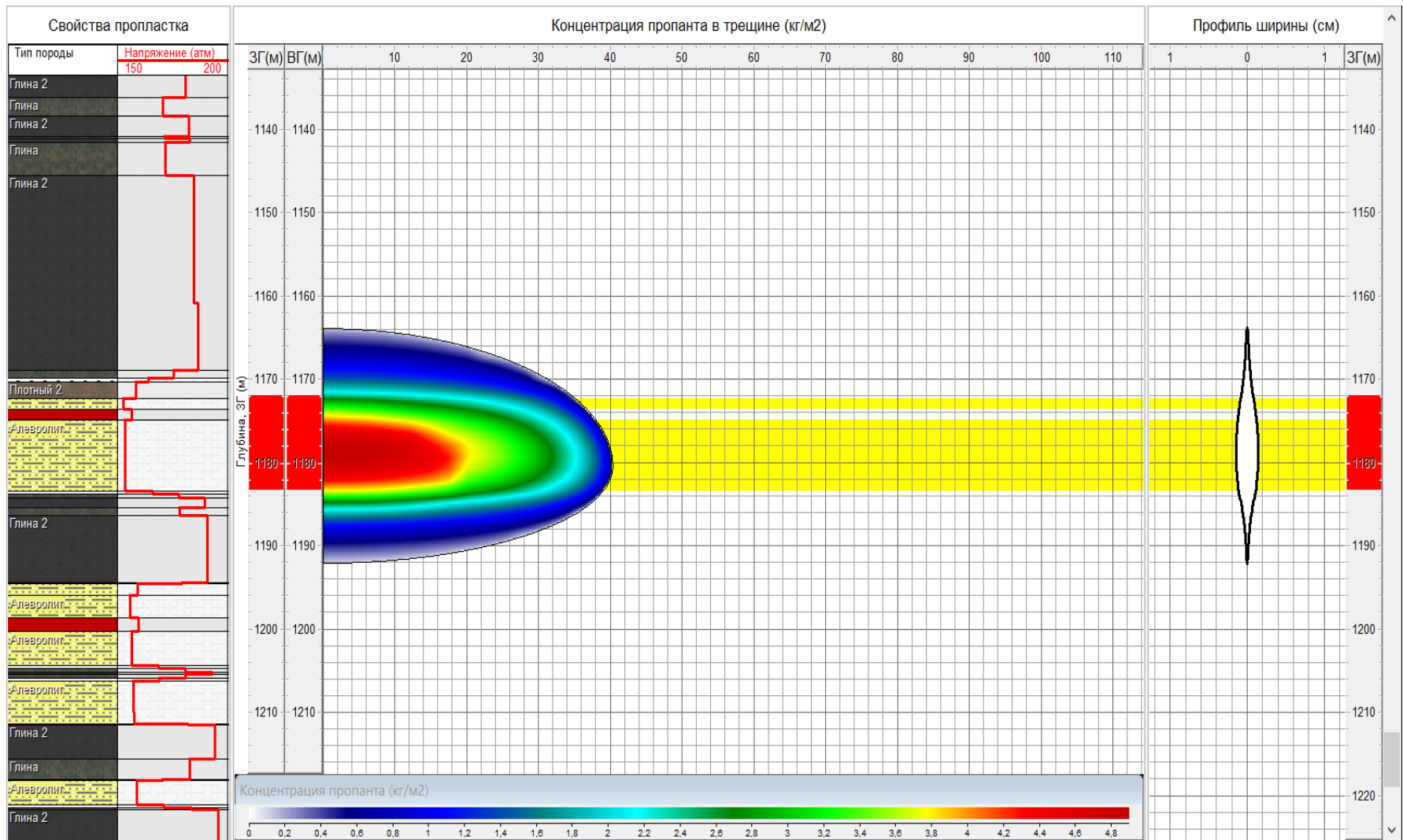


Figure 17 - Fracture profile of well 8952

### 3.2 Fracturing Efficiency Analysis

The increase in fluid production after fracturing is largely dependent on the potential of the well. As a potential, consider the maximum liquid flow rate before fracturing. In the conditions of hydraulic fracturing, not only does it increase the liquid flow rate to the maximum level reached before hydraulic fracturing, but it also significantly exceeds it.

#### Well 1341

On the existing production well stock of well 1341, after hydraulic fracturing, the average change in the well flow rate for liquid (oil) was 3.5 times. The average liquid (oil) production rate increased from 5.3 to 18.5 t/day, and the water cut did not change (50%) (Fig.18).

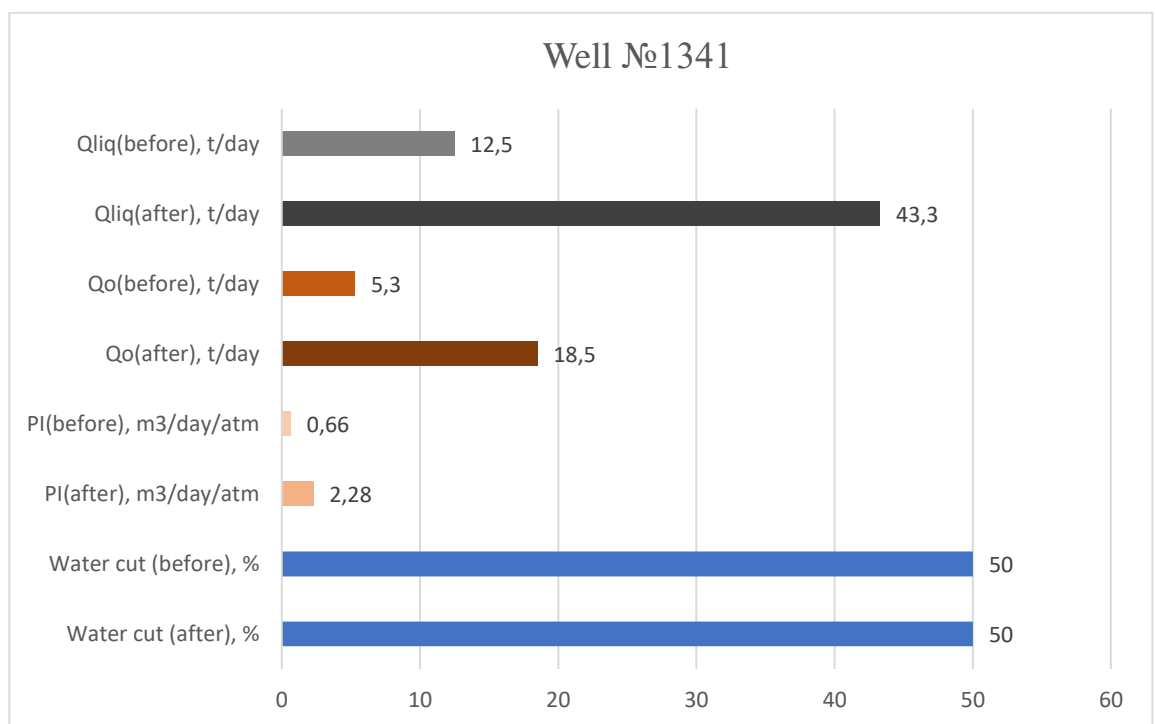


Figure 18 - Change in Well Productivity

#### Well 6493

The formation with a permeability of 8.16 Md increased to 182.8 Md after fracturing. The average liquid (oil) production rate changed from 6.9 to 24.6 tons/day. The average liquid (oil) ratio was 3.5 times (Fig.19).

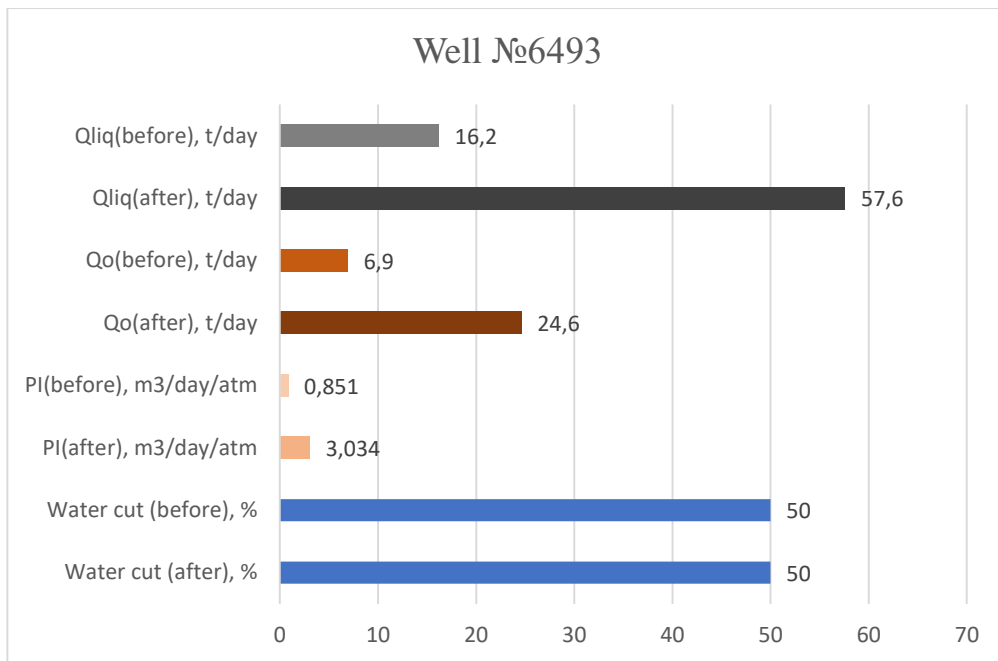


Figure 19 - Change in Well Productivity

### Well 8952

The average flow rate before fracturing was 7.1 t/day, after fracturing it increased to 35.3 t/day. The average oil ratio was 5 times (Fig.20).

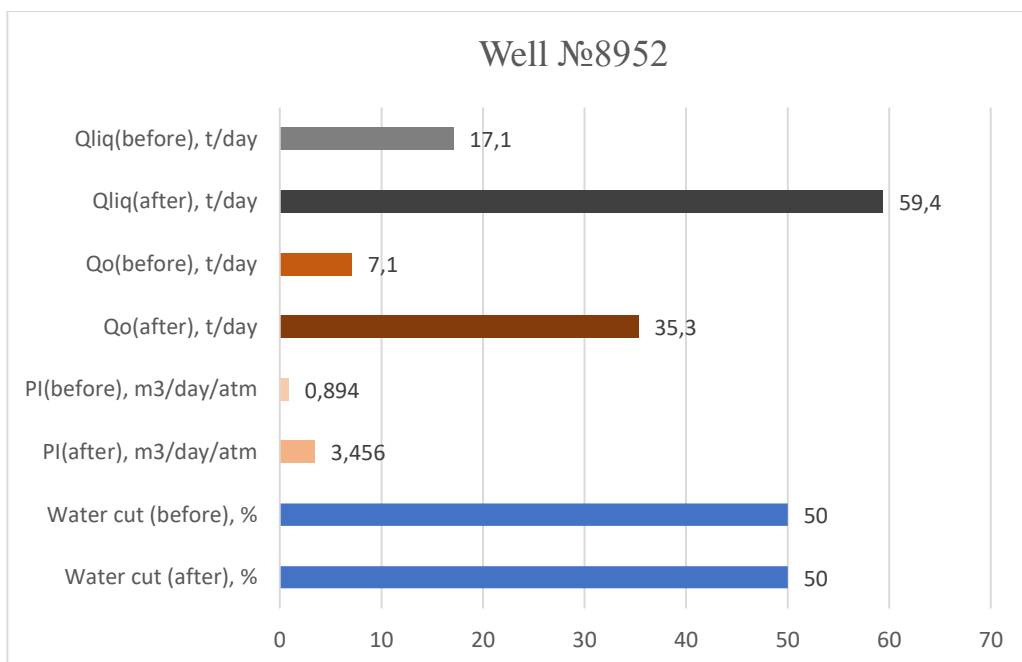


Figure 20 - Change in Well Productivity

As a result of the analysis, fairly reliable associations of the effect size after frac and geological factors, namely permeability, were established.

The main goal of fracturing is to increase permeability by creating a fracture. Permeability increased significantly in all wells after fracturing (Fig.21).

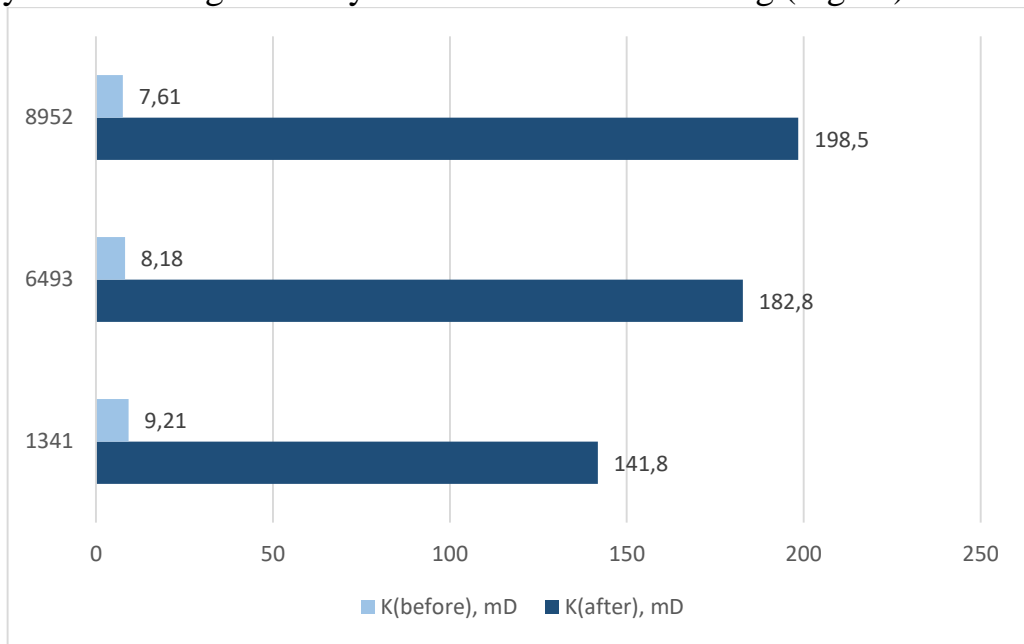


Figure 21 - Change in Well Productivity

Fracturing is often used in low permeability formations, but is also carried out with high permeability. A diagram of the distribution of the ratio of average oil production rates before and after fracturing by permeability groups was built (Fig.22).

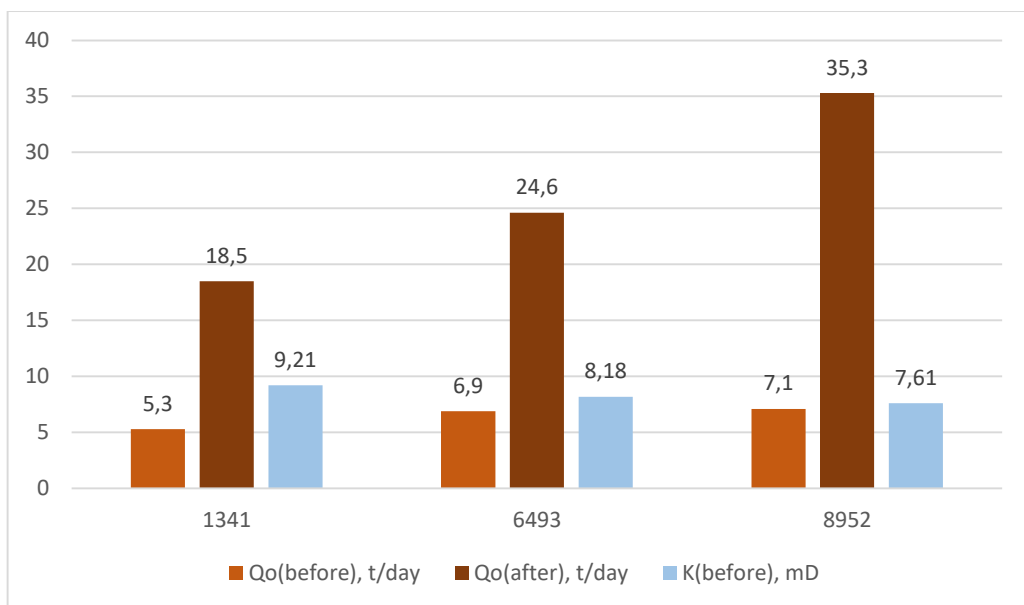


Figure 22 - Oil rate versus permeability

The diagram shows that fracturing in highly permeable formations has little efficiency compared to low and medium permeable formations. If in highly permeable formations the oil production rate increased by 3.5 times, the oil production rate in low

permeable formations increased by 5 times. These figures can be explained by the geology of the formation, namely its texture, which appears as lenticular - discontinuous and parallel - stratified. Zonal and submeridial (versus sublatitudinal) alternation of strip forms of sandstone, shale and rock dissection can be traced.

It can also be assumed that due to the fracturing that the internal macrostructure of the formation is characterized by parallel stratification, which is confirmed by the distribution of discontinuous carbonized fine-grained sandstones, clay sandstones and siltstones with a thickness of 0.2 to 1 m in its composition, the formation has a certain dissection and conducting fracturing operations, thereby we obtain hydrodynamically connected sandstone interlayers (which were previously separated by carbonate and clay interbeds), and as a result, an additional inflow of fluid into the well is obtained.

## **4 Economic part**

### **4.1 Basic data**

The economic assessment of the efficiency of hydraulic fracturing is based on the following assumptions:

Based on the above analysis of the geological part of the project, it was assumed to calculate the basic option for assessing frac efficiency:

- crude commercial oil will be used as the hydraulic fracturing fluid;
- an increase in the average daily oil production rate per year of hydraulic fracturing is expected in the interval of 18-20 t/day;
- duration of frac effect is expected on average about 3 years.
- reduction of the effect of hydraulic fracturing in the second year is 25% of the initial increase in the average daily oil production rate of wells;
- fracturing success rate will be 80%;
- specific gravity of oil 0.85 t/m<sup>3</sup>.

### **4.2 Hydraulic fracturing costs**

The cost of hydraulic fracturing includes material costs, repairs and depreciation of fixed assets, labor, electricity and other production costs.

The company purchases materials for hydraulic fracturing both on the domestic market and abroad.

The domestic market provides for the purchase of diesel fuel for hydraulic fracturing, fuels and lubricants and auxiliary materials for well workover teams, materials and spare parts for the maintenance of equipment, buildings, structures and equipment.

It is planned to purchase the chemicals necessary for fracking: proppant (15 tons per 1 frac), gelling agent (1175 liters per 1 fracturing), breaker (350 kg per 1 fracturing), activator (175 liters per 1 fracturing), and surfactant (584 liters per 1 fracturing).

Prices for materials purchased abroad are accepted at the world level.

### **4.3 Calculation of fracturing cost-efficiency**

We will calculate the efficiency of hydraulic fracturing at the Uzen field. The cost-effectiveness of hydraulic fracturing in oil producing wells is determined.

Table 5 - Input data

Number of wells	3 well
1 Well Rate Increase	19,7 t/day
Duration of technological effect	4 year
Cost of oil (per 1 ton)	1298,7

Price of 1 ton of oil	136 764 tenge
Fracturing cost	1 950 000

1. Additional oil production for 2023

$$\Delta Q = \Delta q \times 365 \times C_e \times n \quad (1)$$

where,  $\Delta q$  - additional oil produced in 1 day;

$C_e$  - coefficient of exploitation

$n$  - number of wells

$$\Delta Q = (19,7 \times 3) \times 365 \times 0,97 = 20\,924,35 \text{ t.}$$

Each year, additional oil production falls by 25%, we will additional oil production for every next 3 years.

$$\Delta Q_{2024} = \Delta Q_{2023} \times 0,75 = 15\,693,3 \text{ t.}$$

$$\Delta Q_{2024} = \Delta Q_{2023} \times 0,5 = 10\,462,2 \text{ t.}$$

$$\Delta Q_{2024} = \Delta Q_{2023} \times 0,25 = 5\,231,1 \text{ t.}$$

2. Increase in revenue from additional oil production

$$\Delta Rev_{2023} = \Delta Q \times C \quad (2)$$

$$\Delta Rev_{2023} = 20\,924,35 \times 136\,764 = 2\,861\,697\,803,4 \text{ tenge}$$

$$\Delta Rev_{2024} = \Delta Rev_{2023} \times 0,75 = 2\,861\,697\,803,4 \times 0,75 = 2\,146\,273\,352,5 \text{ tenge}$$

$$\Delta Rev_{2025} = \Delta Rev_{2023} \times 0,5 = 2\,861\,697\,803,4 \times 0,5 = 1\,430\,848\,901,7 \text{ tenge}$$

$$\Delta Rev_{2026} = \Delta Rev_{2023} \times 0,25 = 2\,861\,697\,803,4 \times 0,25 = 715\,424\,450,8 \text{ tenge}$$

3. Expenses of additional oil production

$$E_{ad} = \Delta Q \times P, \text{ where } P = 454,5 \quad (3)$$

$$E_{ad} = 20\,924,35 \times 454,5 = 9\,510\,117,075$$

$$E_{ad\,2024} = E_{ad\,2023} \times 0,75 = 9\,510\,117,075 \times 0,75 = 7\,132\,587,8$$

$$E_{ad\,2025} = E_{ad\,2023} \times 0,5 = 9\,510\,117,075 \times 0,5 = 4\,755\,058,5$$

$$E_{ad\,2026} = E_{ad\,2023} \times 0,25 = 9\,510\,117,075 \times 0,25 = 2\,377\,529,3$$

4. Expenses of Hydraulic fracturing

$$E_{HF} = 1\,950\,000 \times 3 = 5\,850\,000 \text{ tenge}$$

5. Increase in current expenses

$$\Delta E_{cur} = E_{HF} + E_{ad} \quad (4)$$

$$\Delta E_{cur} = 5\,850\,000 + 9\,510\,117,07 = 15\,360\,117$$

$$\Delta E_{cur\,2024} = E_{ad\,2024} = 7\,132\,587,8$$

$$\Delta E_{cur\,2025} = E_{ad\,2025} = 4\,755\,058,5$$

$$\Delta E_{cur\,2026} = E_{ad\,2026} = 2\,377\,529,3$$

6. Gain profit

$$\Delta Gain_{2023} = \Delta Rev_{2023} - \Delta E_{cur} \quad (5)$$

$$\Delta Gain_{2024} = \Delta Rev_{2024} - \Delta E_{cur\,2024} = 2\,146\,273\,352,5 - 7\,132\,587,8 = 2\,139\,140\,764,7$$

$$\Delta Gain_{2025} = \Delta Rev_{2025} - \Delta E_{cur\,2025} = 1\,430\,848\,901,7 - 4\,755\,058,5 = 1\,426\,093\,843,2$$

$$\Delta Gain_{2026} = \Delta Rev_{2026} - \Delta E_{cur\,2026} = 715\,424\,450,8 - 2\,377\,529,3 = 713\,046\,921,5$$

Table 6 - Calculation of cash and net present value gains

<b>Parameters</b>	<b>Unit</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>
<b>Additional oil production</b>	ton	20 924,35	15 693,3	10 462, 2	5 231,1
<b>Increase in revenue from additional oil production</b>	tenge	2 861 697 803	2 146 273 352	1 430 848 901	715 424 450
<b>Expenses of additional oil production</b>	tenge	9 510 117,075	7 132 587,8	4 755 058,5	2 377 529,3
<b>Expenses of Hydraulic fracturing</b>	tenge	5 850 000	-	-	-
<b>Increase in current expenses</b>	tenge	15 360 117	7 132 587,8	4 755 058,5	2 377 529,3
<b>Gain profit</b>	tenge	2 846 337 686	2 139 140 764	1 426 093 843	713 046 921



## CONCLUSION

The effectiveness of hydraulic fracturing was analyzed. This technology is effective in wells 1341, 6493, 8952 of the Uzen field.

The following geological and technological parameters were taken to evaluate the fracturing efficiency:

- porosity by well log  $K_p$ , %;
- net oil-saturated thickness  $h_o$ , m;
- permeability factor before and after frac  $K$ , mD;
- productivity index before and after fracturing  $PI$ , m<sup>3</sup>/day/atm;
- liquid rate before and after fracturing  $Q_{liq}$ , t/day;
- oil rate before and after fracturing  $Q_o$ , t/day;
- water cut before and after fracturing  $W$ , %;

The analysis showed that the efficiency of fracturing depends on many factors, the main of which are: spatial orientation and geometric dimensions of the crack; well performance before fracturing; description of the bottom hole zone of the formation; reservoir characteristics: degree of heterogeneity, nature of distribution of sand interbeds.

Fracturing significantly affected the filtration-capacitive properties of the layer. Before to fracturing, permeability ranged between 7.61 and 9.21 mD. The largest effect was in well 8952, permeability increased by 26 times, in well 6493 by 22 times, and in well 1341 by 15 times.

After fracturing, oil production increased accordingly. In wells 1341 and 6493, oil production increased by 3.5 times, and in well 8952 it changed by 5 times. After fracturing additional oil production was 20 924,35 t. Expenses of HF was 5 850 000, gain profit reached 2 846 337 686 tenge.

Thus, hydraulic fracturing significantly affects the reservoir properties of the rocks, namely permeability. The degree of geological knowledge of the target determines the effectiveness of hydraulic fracturing. In case of poor knowledge of frac, it can lead to irreparable consequences and economic losses.

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- 8 Р. Е. Магарил, «Теоретические основы химических процессов переработки нефти», 1986
- 9 Е. А. Кожаев, «Анализ эффективности применения ГРП для интенсификации притока жидкости на Игольско-Талавом нефтяном месторождении», 2016
- 10 Gregory F. Ulmishek, «Petroleum Geology and Resources of the Middle Caspian Basin, Former Soviet Union», 2001
- 11 Е. М. Алмухаметова, Н. А. Ворсина, О. В. Сыртланов, «Эффективность применения ГРП в условиях Повховского месторождения», 2013
- 12 В. Е. Андреев, Д. У. Чудинова, А. П. Чижов, А. В. Чибисов, Е. Р. Ефимов, «Геологические условия эффективного применения ГРП неоконских отложений», 2015
- 13 М. С. Кемигов, «Комплекс промыслово-геофизических работ по контролю разработки, анализ результатов комплекса ГИС-контроль, оценка информативности комплекса Уренгейского НГКМ», 2021
- 14 О. С. Уголников, «Условия применения ГРП», 2017
- 15 Б. Б. Хибасов, «Перспективы нефтегазоносности площадей жазгурлинской депрессии южного мангышлака», 2013
- 16 С. Ж. Даукеев, «Глубинное строение и минеральные ресурсы Казахстана», 2002
- 17 U. S. Energy Information Administration, «Technically Recoverable Shale - Oil and Shale Gas Resources: Kazakhstan», 2015
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МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РЕСПУБЛИКИ  
КАЗАХСТАН  
Казахский национальный исследовательский технический университет имени  
К. И. Сатпаева  
Институт геологии и нефтегазового дела им. К. Турысова  
Кафедра гидрогеологии, инженерной и нефтегазовой геологии

**РЕЦЕНЗИЯ**  
на дипломную работу

**Студент:** Изтурганова Гулайым Қосайқызы

**Специальность:** 6В05202 – «Геология и разведка месторождений  
полезных ископаемых»

**Тема дипломной работы:** «Геологическое строение и нефтегазоносность  
Южно-Мангышлакской системы, изучение коллекторских свойств  
продуктивных горизонтов и влияния ГРП на фильтрационно-емкостные  
свойства терригенных пород месторождения Узень».

Данная дипломная работа посвящена изучению геологического строения,  
тектоники, нефтегазоносности Южного Мангышлака и влияние гидравлического  
разрыва пласта (ГРП) на геологические факторы.

В дипломной работе представлены результаты геофизических анализов по  
коллекторским свойствам продуктивных горизонтов. Были сделаны анализы для  
определения эффективности метода ГРП, а так же рассмотрены условия  
применения ГРП с учетом геологического строения месторождения Узень.

Дипломная работа, выполненная Изтургановой Гулайым Қосайқызы на  
тему «Геологическое строение, тектоника, нефтегазоносность Южного  
Мангышлака, коллекторские свойства продуктивных горизонтов и влияние  
гидравлического разрыва пласта на фильтрационно-емкостные свойства  
терригенных пород месторождения Узень», полностью соответствует  
требованиям, предъявляемым к дипломным работам, а автор рекомендуется к  
защите и оценивается на 98 баллов.

**Рецензент**

кан. геол-минерал. наук ВНС

  
Подпись **Фазылов Е.М.**

«1» 06



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF  
KAZAKHSTAN

K.I. Satbayev Kazakh National Research Technical University  
K. Turyssov Geology and Oil-Gas Business Institute  
Department of Hydrogeology, Engineering and Petroleum Geology

**REVIEW**

for thesis

**Student:** Gulaiym K. Izturganova

**Specialty:** 6B05202 – «Geology and exploration of mineral deposits»

**Topic:** «Geological structure, tectonics and oil content of South Mangyshlak basin, reservoir properties of productive horizons and influence Hydraulic Fracturing to filtration-capacitive properties of Uzen field's terrigenous rocks»

The geological part of the thesis fully includes the general characteristics of the South Mangyshlak and the Uzen field, geological structure, tectonics, and oil and gas content. These sections are considered comprehensively, when writing works it is determined that they are written based on geological background data, and not only literature.

The special part of the thesis is devoted to studying the reservoir properties of productive horizons and the influence of hydraulic fracturing on the filtration-capacitive properties of rocks.

The thesis performed by Izturganova Gulaiym Kosaikyzy on the topic «Geological structure, tectonics and oil content of South Mangyshlak basin, reservoir properties of productive horizons and influence Hydraulic Fracturing to filtration-capacitive properties of Uzen field's terrigenous rocks» fully complies with the requirements and the student is recommended for the thesis defence.

Department of  
Hydrogeology, Engineering  
and Petroleum Geology,  
PhD

Tolganay S. Jarassova

*Signature*

«2» 06 2023 г.

## Протокол

### о проверке на наличие неавторизованных заимствований (плагиата)

Автор: Изтурганова Гулайым Қосайқызы

Соавтор (если имеется):

Тип работы: Дипломная работа

Название работы: 2023\_БАК\_Изтурганова Гулайым Қосайқызы.docx

Научный руководитель: Толганай Джарасова

Коэффициент Подобия 1: 6

Коэффициент Подобия 2: 1.7

Микропробелы: 119

Знаки из других алфавитов: 37

Интервалы: 0

Белые Знаки: 0

После проверки Отчета Подобия было сделано следующее заключение:

Заимствования, выявленные в работе, является законным и не является плагиатом. Уровень подобия не превышает допустимого предела. Таким образом работа независима и принимается.

Заимствование не является плагиатом, но превышено пороговое значение уровня подобия. Таким образом работа возвращается на доработку.

Выявлены заимствования и плагиат или преднамеренные текстовые искажения (манипуляции), как предполагаемые попытки укрытия плагиата, которые делают работу противоречащей требованиям приложения 5 приказа 595 МОН РК, закону об авторских и смежных правах РК, а также кодексу этики и процедурам. Таким образом работа не принимается.

Обоснование:

*Заимствования выявленные в работе является законным и не является плагиатом.*

*Дата*

*31.05.23*

*Беріні*

проверяющий эксперт

## Протокол

### о проверке на наличие неавторизованных заимствований (плагиата)

Автор: Изтурганова Гүлайым Қосайқызы

Соавтор (если имеется):

Тип работы: Дипломная работа

Название работы: 2023\_БАК\_Изтурганова Гүлайым Қосайқызы.docx

Научный руководитель: Толганай Джарасова

Коэффициент Подобия 1: 6

Коэффициент Подобия 2: 1.7

Микропробелы: 119

Знаки из других алфавитов: 37

Интервалы: 0

Белые Знаки: 0

После проверки Отчета Подобия было сделано следующее заключение:

- Заимствования, выявленные в работе, является законным и не является плагиатом. Уровень подобия не превышает допустимого предела. Таким образом работа независима и принимается.
- Заимствование не является плагиатом, но превышено пороговое значение уровня подобия. Таким образом работа возвращается на доработку.
- Выявлены заимствования и плагиат или преднамеренные текстовые искажения (манипуляции), как предполагаемые попытки укрыва плагиата, которые делают работу противоречащей требованиям приложения 5 приказа 595 МОН РК, закону об авторских и смежных правах РК, а также кодексу этики и процедурам. Таким образом работа не принимается.

Обоснование: *Заимствования, выявленные в работе не превышают допустимого предела*

Дата  
*31.05.23*

Заведующий кафедрой  


Университеттің жүйе администраторы мен Академиялық мәселелер департаменті  
директорының ұқсастық есебіне талдау хаттамасы

Жүйе администраторы мен Академиялық мәселелер департаментінің директоры көрсетілген еңбекке қатысты дайындалған Плагиаттың алдын алу және анықтау жүйесінің толық ұқсастық есебімен танысқанын мәлімдейді:

Автор: Ізтұрғанова Гүлайым Қосайқызы

Тақырыбы: 2023\_БАК\_Ізтұрғанова Гүлайым Қосайқызы.docx

Жетекшісі: Толғанай Джарасова

1-ұқсастық коэффициенті (30): 6

2-ұқсастық коэффициенті (5): 1.7

Дәйексөз (35): 0

Әріптерді ауыстыру: 37

Аралықтар: 0

Шағын кеңістіктер: 119

Ақ белгілер: 0

Ұқсастық есебін талдай отырып, Жүйе администраторы мен Академиялық мәселелер департаментінің директоры келесі шешімдерді мәлімдейді :

Ғылыми еңбекте табылған ұқсастықтар плагиат болып есептелмейді. Осыған байланысты жұмыс өз бетінше жазылған болып санала отырып, қорғауға жіберіледі.

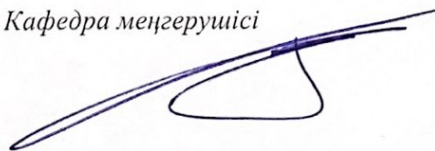
Осы жұмыстағы ұқсастықтар плагиат болып есептелмейді, бірақ олардың шамадан тыс көптігі еңбектің құндылығына және автордың ғылыми жұмысты өзі жазғанына қатысты күмән тудырады. Осыған байланысты ұқсастықтарды шектеу мақсатында жұмыс қайта өңдеуге жіберілісін.

Еңбекте анықталған ұқсастықтар жосықсыз және плагиаттың белгілері болып саналады немесе мәтіндері қасақана бұрмаланып плагиат белгілері жасырылған. Осыған байланысты жұмыс қорғауға жіберілмейді.

Негіздеме: *Ғылыми еңбекте табылған ұқсастықтар жұмыс өзі жазылған болып санала отырып, қорғауға жіберіледі.*

Күні  
31.05.23

Кафедра меңгерушісі





## Метаданные

Название

**2023\_БАК\_Ізтұрғанова Гүлайым Қосайқызы.docx**

Автор

**Ізтұрғанова Гүлайым Қосайқызы**

Научный руководитель / Эксперт






**Толганай Джарасова**

Подразделение

**ИГИНГД**

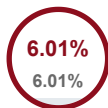
## Оповещения

В этом разделе вы найдете информацию, касающуюся текстовых искажений. Эти искажения в тексте могут говорить о ВОЗМОЖНЫХ манипуляциях в тексте. Искажения в тексте могут носить преднамеренный характер, но чаще, характер технических ошибок при конвертации документа и его сохранении, поэтому мы рекомендуем вам подходить к анализу этого модуля со всей долей ответственности. В случае возникновения вопросов, просим обращаться в нашу службу поддержки.

Замена букв		37
Интервалы		0
Микропробелы		119
Белые знаки		0
Парафразы (SmartMarks)		44

## Объем найденных подоби

Обратите внимание! Высокие значения коэффициентов не означают плагиат. Отчет должен быть проанализирован экспертом.



КП1

**25**

Длина фразы для коэффициента подобия 2



КП2

**6303**

Количество слов



КЦ

**40416**

Количество символов

## Подобия по списку источников

Просмотрите список и проанализируйте, в особенности, те фрагменты, которые превышают КП №2 (выделенные жирным шрифтом). Используйте ссылку «Обозначить фрагмент» и обратите внимание на то, являются ли выделенные фрагменты повторяющимися короткими фразами, разбросанными в документе (совпадающие сходства), многочисленными короткими фразами расположенные рядом друг с другом (парафразирование) или обширными фрагментами без указания источника ("криптоцитаты").

### 10 самых длинных фраз

Цвет текста

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ И АДРЕС ИСТОЧНИКА URL (НАЗВАНИЕ БАЗЫ)	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)	
1	Features of hydraulic fracturing in late-stage fields with medium and high water cut 5/10/2021 Satbayev University (ИГИНГД)	42	0.67 %
2	Identification of the most effective candidate well for hydraulic fracturing using machine learning 5/12/2021 Satbayev University (ИГИНГД)	39	0.62 %



3	Identification of the most effective candidate well for hydraulic fracturing using machine learning 5/12/2021 Satbayev University (ИГИНГД)	27	0.43 %
4	Features of hydraulic fracturing in late-stage fields with medium and high water cut 5/10/2021 Satbayev University (ИГИНГД)	22	0.35 %
5	Identification of the most effective candidate well for hydraulic fracturing using machine learning 5/12/2021 Satbayev University (ИГИНГД)	19	0.30 %
6	Identification of the most effective candidate well for hydraulic fracturing using machine learning 5/12/2021 Satbayev University (ИГИНГД)	18	0.29 %
7	Selection and evaluation of an effective method of enhanced oil recovery on the example of reservoir X 5/16/2020 Satbayev University (ИГИНГД)	17	0.27 %
8	<a href="http://asoiu.edu.az/public/photos/kONFRANS_67_KITAB.pdf">http://asoiu.edu.az/public/photos/kONFRANS_67_KITAB.pdf</a>	16	0.25 %
9	Features of hydraulic fracturing in late-stage fields with medium and high water cut 5/10/2021 Satbayev University (ИГИНГД)	15	0.24 %
10	<a href="http://asoiu.edu.az/public/photos/kONFRANS_67_KITAB.pdf">http://asoiu.edu.az/public/photos/kONFRANS_67_KITAB.pdf</a>	15	0.24 %

#### из базы данных RefBooks (0.52 %)

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)	
<b>Источник: Paperity</b>			
1	Rainfall dynamics at different temporal scales: A chaotic perspective B. Sivakumar, B. Sivakumar;	15 (2)	0.24 %
2	Interlingual Homonyms in Spanish and Italian: False Friends – Real Enemies of Translators. Onishchenko M.Y., Pysmennyi T.E., Pliushchai A.A.;	11 (1)	0.17 %
3	Chayandinskoye field is the project of new technologies implementation in East Siberia Andrei P. Pravdukhin, Arkadii R. Kurchikov, Vladimir N. Borodkin, Oleg A. Smirnov, Aleksandr V. Pogretskii, Aleksei V. Davydov, Andrei V. Lukashov;	7 (1)	0.11 %

#### из домашней базы данных (4.76 %)

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)	
1	Identification of the most effective candidate well for hydraulic fracturing using machine learning 5/12/2021 <b>Satbayev University (ИГИНГД)</b>	<b>143 (9)</b>	<b>2.27 %</b>
2	Features of hydraulic fracturing in late-stage fields with medium and high water cut 5/10/2021 <b>Satbayev University (ИГИНГД)</b>	<b>118 (8)</b>	<b>1.87 %</b>

3	Selection and evaluation of an effective method of enhanced oil recovery on the example of reservoir X 5/16/2020 Satbayev University (ИГИНГД)	33 (3)	0.52 %
4	Каспий маңы бассейнінің оңтүстік-шығысындағы тұз үсті шөгінділердің тектоникасы, мұнайгаздылығы және Шығыс Мақат кенорны бойынша қосымша барлау жобасы.docx 4/26/2018 Satbayev University (ИГИНГД)	6 (1)	0.10 %

из программы обмена базами данных (0.00 %)



ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
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из интернета (0.73 %)



ПОРЯДКОВЫЙ НОМЕР	ИСТОЧНИК URL	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
1	<a href="http://asoiu.edu.az/public/photos/kONFRANS_67_KITAB.pdf">http://asoiu.edu.az/public/photos/kONFRANS_67_KITAB.pdf</a>	46 (4) 0.73 %

**Список принятых фрагментов** (нет принятых фрагментов)

ПОРЯДКОВЫЙ НОМЕР	СОДЕРЖАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
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