KHAZAR UNIVERSITY

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MS THESIS

Title: The Effect of the Magnetic Method to the Wells' Productivity in Surakhany Field

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ABSTRACT

Actuality of theme. Currently, most biggest problem, specialists are busy, in oil industry is to increase oil and gas production of fields. In this century, scientists have focused on to the production of carbohydrogens in hard conditions, such as heavy oil, paraffined oil, shale gas etc. While another most important issue is to increase the production of current fields with decreased carbohydrogen reserves. In most cases, enhanced oil recovery (EOR) methods do not give the results, either zero, or effective. That’s why, there is a need to the invention of the new production methods. In this thesis, we will focus on the method is magnetic method, which the scientists of Azerbaijan Oil-Chemistry Institution, A. Mirzajanzade and A. Mammadzade has worked on it in laboratory condition and after getting great results they have introduced this new method for application in the fields from 1970s.

Magnetic method has started mainly to be applied in the Azerbaijan and former Soviet fields from 1975. Even this method has been used for the aim of prevention of Neft Dashlary rigs’ corrosion and extension of its life. The life of rigs has been extended by the two times. Magnetic method has been applied by our scientists within former Soviet republics, Tatarstan and the Republic of Bashkir apart from Azerbaijan, while outside of Soviet republics in Vietnam and got high results. The results were between 90-98%, which by the water injection method, one of the most common recovery methods, maximum 70-80% production is possible to get.

The aim of this master thesis is to show briefly, based on field datas how the productivity of the Surakhany field’s wells has increased after application of Magnetic method. The thesis is dedicated to production optimization of wells in Balakhany-Sabunchu-Ramana reservoir with the application of magnetic fields.

Theme of the master thesis.

The master thesis is consist of introduction, four sections, calculation, conclusion and references.

In introduction the examples of magnetic fields' applications and their importance were described.

To increase production rates of wells' investigations were provided based on the field data.

Balakhany-Sabunchu-Ramana field's geological and development characteristics was given briefly. Well dynamics were described and pressure rates were investigated.

The information about the exploration and development history of the Surakhany oilfield has been provided.

Magnetic method was suggested to enhance oil wells' productivity of the Surakhany fields. The investigations have been done in Surakhany field.

At the end of the master thesis, appropriate conclusions were obtained and given recommendations for optimum well performance.

References of sources were shown.

The results of the master thesis can be applied in oil fields in all phases of development stages.

XÜLASƏ

Mövzunun aktuallığı. Hazırda neft sənayesində mütəxəssisləri məşğul edən ən böyük problem yataqların neft-qaz hasilatını artırma məsələsidir. Dövrümüzdə artıq alimlər tərəfindən ağır neftlər, parafinli neftlər, şist qaz və s. kimi çətin şəraitlərdəki karbohidrogenlərin hasil olunmasına fikir verilməyə başlanıb. Digər qarşıda duran əsas məsələ isə karbohidrogen ehtiyatı azalan cari yataqların hasilat qabilliyyətini artırmaqdır. Bir çox hallarda isə köhnə hasilat üsulları ya heç, ya da tam effektiv nəticə vermir. Buna görə də yeni hasilat üsullarının kəşf olunmasına zərurət yaranır. Bu tezisdə üstündə duracağımız üsul keçən əsrin 70-ci illərindən etibarən o vaxtkı adı ilə Azərbaycan Neft-Kimya İnstitutunun görkəmli alimləri A. Mirzəcanzadə və A. Məmmədzadənin laboratoriya şəraitində işləyib hazırladığı və aldıqları yüksək nəticələrdən sonra yataqlarda tətbiq olunmaq üçün təklif etdikləri Maqnit üsuludur.

Maqnit üsulu əsas etibarilə 1975-ci ildən etibarən Azərbaycan və keçmiş SSRİ miqyasında yataqlarda tətbiq olunmağa başlayıb. Bu üsul hətta Neft Daşları platformalarının çürüməsinin qarşısının alınması və ömrünün uzadılması məqsədilə də istifadə olunub. Platformaların ömrü iki dəfəyə qədər uzadılıb. Maqnit üsulu alimlərimiz tərəfindən keçmiş SSRİ daxilində Azərbaycandan başqa Tatarıstan və Başqırdıstan, xaricdə isə Vyetnam yataqlarında tətbiq olunub və yüksək nəticələr əldə olunub. Nəticələr 90-98% arasında olub, hansı ki, çox tətbiq olunan üsullardan biri olan suvurma üsulu ilə maksimum 70-80% hasilat əldə etmək mümkündür.

Bu magistr işinin məqsədi Maqnit üsulunun Suraxanı yatağında tətbiqindən sonra yatağın quyularının məhsuldarlığının necə artdığını mədən məlumatları əsasında yığcam şəkildə göstərməkdir. Tezis maqnit sahələrinin tətbiqilə Balaxanı-Sabunçu-Ramana yatağındakı quyuların hasilatının optimallaşdırılmasına həsr olunmuşdur.

Magistr işinin məzmunu.

Magistr işi giriş, dörd bölmə, hesablama, nəticə və ədəbiyyatdan ibarətdir.

Giriş hissədə maqnit sahələrinin tətbiqinə aid misallar və onların önəmi izah olunmuşdur.

Quyuların hasilat səviyyələrinin artırılmasına dair tədqiqatlar yataq məlumatları əsasında aparılmışdır.

Balaxanı-Sabunçu-Ramana yatağının geoloji və istismar xarakteristikası qısaca olaraq verilmişdir. Quyu dinamikası izah olunmuş və təzyiq səviyyələri tədqiq olunmuşdur.

Suraxanı yatağının kəşfiyyat və işlənmə tarixi barədə məlumatlar verilmişdir.

Suraxanı yatağındakı neft quyularının hasilatının artırılması üçün Maqnit üsulu təklif olunmuşdur. Yataqda tədqiqatlar aparılmışdır.

Tezisin sonunda müvafiq nəticələr əldə olunmuş və quyuların optimal işlənməsi üçün tədbirlər göstərilmişdir.

İstifadə olunmuş ədəbiyyatın siyahısı verilmişdir.

Magistr işinin nəticələri neft yataqlarının işlənməsinin bütün mərhələlərində tətbiq oluna bilər.

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INTRODUCTION

The experience of the last years shows high rationality of application of magnetic fields for development of the technological processes row. The magnetic fields show well itself in solution of the following problems being high technological effect source:

- Increase of the ability of acceptance of multiplication wells
- Development of the bottom zones of wells’ filtration-volume characters due to magnetized agent treatment
- Intensification of gas-fluid processes during gas separation
- Adjusting of appearance degree of electricity in the hydraulic flows
- Decrease of hydraulic resistance of transported product against the flow
- Adjusting of bubble pressure
- Development of drilling fluids and other technological fluids in workover process of wells
- Decrease of the intensiveness of settlement of paraffin and salts in pump compressor pipes and transportation of oil
- Prevention of corrosion
- Hydrate formation

Below the importance of magnetic method has been detailed explained. The information, about the application in Surakhany field, was given.

CHAPTER 1. OROGRAPHY OF BALAKHANY-SABUNCHU-RAMANA FIELD

Balakhany-Sabunchu-Ramana field is located in the 12 km to the north east of Baku city. Three areas are included in the field. Balakhany in the west, Sabunchu in the center and Ramana in the east. The area of Balakhany-Sabunchu-Ramana field consists of the not-smooth, oval, wide altitude having little height and lying in the direction of coming down. Bogh-bogha mud volcano is located in the west of Balakhany village. This hill place lowers gradually from Bogh-Bogha mud volcano and is replaced by Zabrat flat. Boyuk Shor lake is located in the south east of Balakhany. Absheron limestone are extracted in the south edge of the lake. Ramana lake is located in the south of Ramana area. Ramana lake encircles Absheron limestone extraction so that this extraction describes clearly the pereclinal area of planad anticlinal wrinkles. The length of Balakhany-Sabunchu-Ramana oil field is 10 km and its width is 3 km. [2]

1.1 Tectonics

Balakhany-Sabunchu-Ramana field is located on great anticlinal axis lying in the direction of north-west, south-east. The length of the wrinkle is 10 km and the width is 3 km. The thickness of horizons is till 40, 60 in Gosha pool and 10-15 in the south wing.

Lying down angle on the zone around disturbed north-east wing and the axis of the wrinkle is 10-15. Pod-Gyrmaky and Pereriv suites appears around Bogh-Bogha mud volcano. Arch of the wrinkle consists of upper horizons of the productive stratum. Aghjagyl and Absheron stages come to the surface in the direction of setting of the axis of the wrinkle on the wings. The disturbances lines noted at the structural maps divide the central part of the wrinkle into some areas.

The width way layer passing in the south-east and east direction give character like steps to that area. Every eastern area has been lied down in comparison with the western area. Lengthways strata have different character. A part of them is on the south and the other part is on the north. The width way strata extinguishes in the upper section and even doesn’t reach to Balakhany suites. In its turn it is the evidence of formation of strata after the process of formation of wrinkles. The amplitude of width way strata is 10-40 m. The lengthways strata go deeper and their amplitude increases.

1.2 Field Development History

Russian scientists as Gubkin, Golubyatnikov, Abramovich played a great role in learning of Balakhany-Sabunchu-Ramana field. They have given stratigraphic cutting of Balakhany-Sabunchu-Ramana field. Golubyatnikov was engaged in investigation of Absheron peninsula and Baku oil fields in 1901. The development history of Balakhany-Sabunchu-Ramana field was begun from 1869. At that time Mirzoyev opened 1Y horizon for 42 m on the north side of the wrinkle and the first oil was extracted. Although the production of this well was small, this well opened 1Y horizon in 38 m deepness and 300 ton oil gushed every day. Savage exploitation of the field caused to water cutting in all the area during Russia authority. [2]

Pod-Gyrmaky Clay Suite and Pod-Gyrmaky Sandy Suite were opened in 1906. After having established the Soviet government in Azerbaijan in 1920 new period began in oil industry. After having nationalized the oil industry, Gyrmaky and Nad-Gyrmaky suites were opened. The exploration well № 13142 was drilled in Nad-Gyrmaky in 1920. 300t production was received from this well every day. Afterwards, those suites upon all the field was learned by exploration. Until present time those horizons are the principal objects of exploitation. It was clear from the old exploitation information that the horizon 1Y had industrial importance. Its general production was 74.2 million t. Then 1Y horizon 29.7 million t and lastly S horizon with 23 million t production.

1.3 Stratigraphy of Balakhany-Sabunchu-Ramana Field

All sediments till the pound beginning from the sediments of Absheron stage participate in the stragtigrafic cutting of Balakhany-Sabunchu-Ramana wrinkle. Wrinkles passed through Diatom, Spiralno strata in the western part of region and reached to Maikop suite. It is possible to meet modern sediments of less deepness on the area of region, but they don't interest. [2]

1.3.1 Pontian Sediments

Pontian sediments are divided into two sections at the place where pontian stage sediments of the drilled wells on the area of Balakhany-Sabunchu-Ramana.

1. Lower section: Consisting of sandy clays.
2. Upper section: Consists of limestone and clay of green color.

Fauna: The thickness of pont is 254m in the well number 1643.

1.3.2 Productive Series (PS)

The deepness of PS of the deposit is 1270m in the western side. While in the eastern part, it is 1700 m. This layer is divided into three parts:

Lower section: PGCS, PGSS, GS, NGS

Middle section: Pereriv Suite

Upper section: Surakhany, Sabunchu, Balakhany suites

Fauna point of view the PS is poor. Initial water amount is small:

Table 1. Sections of the PS

Section Suites		Thickness, m	
		West	East
Upper	Surakhany	130	405
	Sabunchu	274	301
	Balakhany	363	446
Middle	Pereriv Suite	29	100
Lower	PGCS	28	31
	PGSS	40	48
	GS	257	258
	NGS	80	94

1.3.2.1 Lower Section of the PS

Pod-Gyrmaky suite (PG) is located on stage of pont. This suite consists of the lowest part of the PS. The thickness of PG suite is 60-115m. According to its lithological composition, grain sand consists of black corner gravels. According to the comparison of logging diagrams and well cuttings, it is possible to divide PG into five horizons. The PS in Balakhany-Sabunchu-Ramana area begins with this suite. [2]

Gyrmaky Suite (GS)

This suite takes its name from Gyrmaky valley, because this layer came to the surface on Gyrmaky valley. GS consists of alternation of grain sand, sandstones, clay and clay sand. Clay and sand set of GS is measured in cm. The thickness of layers reaches to 100m. While general thickness of GS is 250-280m. GS is divided to 2 parts: II GS is 100m, I GS is 150m. The lower stratum has more hydrocarbons. According to well logging data, the parts are divided into separate suites as well:

Lower part:	II GS-1	thickness	20m
	II GS-2	thickness	17m
	II GS-3	thickness	20m
	II GS-4	thickness	23m
	II GS-5	thickness	20m

Upper part:	I GS-1	thickness	40m
	I GS-2	thickness	45m
	I GS-3	thickness	33m
	I GS-4	thickness	32m

Nad-Gyrmaky Sandy Suite (NGSS)

NGSS consists of sand. There are black colored gravels and large quartz inside it. The thickness of NGSS is 40m and reaches to 50m in the east. This suite has oil-bearing in Balakhany-Sabunchu area and water cut in Ramana. [2]

Nad-Gyrmaky Clay Suite (NGCS)

NGCS consists of alternation of different sand and clay strata. The average thickness of NGCS cluster is 30m.

Pereriv Suite

This part of PS is called Pereriv. Lithological compound consists of half-round clay pieces stratified by quartz of rough grain. Oil-bearing shows itself near the village of Balakhany and in one area. [2]

1.3.2.2 Upper Section of the PS

Balakhany Suite (BS) takes its name from Balakhany village, because the suite comes to the surface near Balakhany village. BS consists of little and middle grain sand and thin clay strata. The thickness of this suite is about 370m. BS is divided into Y, YI, YII, YIII, IX, X horizons:

X horizon

This suite is located on the heel of horizon consisting of alternation of sand and gravel and it distinguishes this horizon from Pereriv suite. X horizon is specially water cut area. This horizon consists of middle and big sand grains. The thickness of X horizon is 8-10m. X horizon also distinguishes from IX horizon by its clay.

IX horizon

This horizon consists of middle grained sands and thin clay layers. As clay is distributed equally upon horizon, they comprise alternation as sand and clay replace each other. The thickness of horizon is 45-55m.

YIII horizon

This horizon entirely consists of middle grained sands, deprived of clay. The thickness of horizon is 60m. There are also 2-3m clay layer on this horizon.

YII horizon

This horizon consists of middle grained sands. It is possible to meet insignificant clay layers here. Its general thickness is between 3-100m.

YI horizon

This horizon consists of middle grained sand stratified by clay. The thickness of horizon is 41m. [2]

Y horizon

This horizon consists of small grained sands. Clay layer divides the horizon into three layers with 2-3 m thickness. The thickness of horizon changes between 34-40m from east to west. Y horizon has most oil saturation. The lithological composition of this horizon is stable within all area. There are 2-3m oil-bearing sand inside clay layer between Y-YI horizons and these are exploited.

Sabunchu Suite

It differs from upper suites by the stability of cutting and abundance of oil horizons. Oil bearing II, III, 1Y, 1Ya, 1Yv, 1Ys horizons are also included in this cluster. Average thickness of Sabunchu suite is 270m. 1Yo, 1Yd, 1Ya differs from 1 Yv horizon because of their layers. The thickness of these strata is 52m. 1 Yv horizon's lithological compound consists of sand stones and brown clay, small and fine grained thin sand layers. Its average thickness is 25m. Generally, 1Y horizon's sand suite (1Y, 1Ya, 1Yv) consists of small and medium grained sands.

According to oil-bearing level, III horizon is the most important horizon of Sabunchu suite. There is also a suite under this horizon consisting of grey and brown clay and small and fine grained sands. [11]

II Horizon consists of small and fine grained sands. This sands separate clay layers from each other. The thickness of horizon is between 20-24m. According to the lithological compound, the clay suite, lying down under II horizon, alternates with brown sands. Its general thickness is 20-35m. 40-45m brown and grey colored clay lies on the II horizon. In rare cases we can encounter small grained sand layers in clay layers.

Surakhany Suite

This suite consists of alternation of dark grey colored clay and sand in Balakhany-Sabunchu-Ramana field. There is industrial important oil in these strata.

This suite is divided into the following horizons both lithological and oil-bearing point of view: C, CD, D, Ya, Y. C, D, Ya, Y horizons are oil-bearing. Its lithological composition consists of small grained sands. The diameter of these grains is between 0.05-0.5 m. Total thickness of Surakhany suite is 130m. C sandy stratum is considered the stratum having more sand in Surakhany suite. This stratum is oil-bearing. The thickness of stratum is 12-14m. [11]

1.3.3 Aghjagyl Stage

There are 3m black clays in the upper part and grey, dark grey and brown clays in the middle part of this stage.

1.3.4 Absheron Stage

Absheron oil-gas bearing district is a part of Caspian oil-gas bearing basin and covers its north-western edge. By territory, Absheron oil-gas bearing district was composed of aggregate of seacoast of the namesake peninsula adjacent to it and multiple islands and underwater bulges. The age of sediments participating in geological structure of Absheron oil-gas bearing district changes in a large range from Jura sediments to Anthropogen. So, in the acute landing area from north-west to south-east, the emergence of younger sediments to the earth was observed.

Absheron is divided into three sections because of its fauna and lithological composition:

1. Lower section: This section consists of clay and its thickness in the western part is 80m, while in the eastern part is 300m. The average thickness of the section is 120m. It is possible to encounter 10-15cm volcano ash in the lower part.

2. Pereriv Suite: This section consists of limestone clay stratified by dark colored sand.
3. Upper Section: The average thickness of this section is 70m. The thickness is 360m in the eastern part and it decreases going to west and south. 13-18m carbonate rocks with cockleshells are characteristic for middle section.

Old sediments of upper cretaceous with flysch formation come to the surface in the external north-west areas (Yunusdagh, Ilkhydagh, Goytepe etc.). According to the group information 1100 and No 7, the Santon level sediments were found in Aghburun zone at 1140m depth. [3]

Pliocene-Miocene aged sediments consist of clays and marls and come to the earth's surface in the west and north-west part of the district. Their thickness is 2500-3000m in Garadagh, Balakhany, Mashtagha, Buzovna, Pirallahy, Neft Dashlary and in gas-bearing parts through the wells.

Pliocene aged sediments have widely spread in Absheron oil-gas bearing district. It should be pointed out that, the Pont phase that lying under the Pliocene aged sediments and which is considered to be the upper part of Miocene come to the earth's surface in some areas of western Absheron and Chilov Island (arch part) and it has almost been opened in all the areas through the well. The sediments of this level consist of clays and thickness is 200-250m.

PS sediments of Pliocene are of great importance in Pliocene section and well-known oil-gas bearing fields in Absheron oil-gas bearing district are associated with these sediments. PS sediments consist of alternation of sands, clays, marls and their thickness is 1200m in the north part of peninsula and up to 750-3800m in deeper areas. The thickest part of PS was mentioned in Haradagh-Hovsan, Gum Adasy, Zira areas. It was also found that the thickness of PS in the south field is more than 3300. The thickness of PS in north part of Absheron archipelago, Goshadash, Aghburun, Gyladasy areas is 1900-1950m. Pod-Gyrmaky sandy suite of PS is a section with the least thickness (55-60m), but the suite with the most thickness is Gala suite (420-430m in Zira, 600 m Neft Dahslary etc.), Gyrmaky suite in this area has 260-270m thickness. Upper section of PS is characterized by high thickness. For example, thickness in Balakhany suite is more than 600m in Garadagh area, 650-700m in Surakhany territory, 400-1450m in Garadagh, Lokbatan, Surakhany suites and even 1900m in Garadagh-Zira zone.

The Nad-Gyrmaky, Pod-Gyrmaky sandy, Fatmayy and Balakhany suites that are most sandiness mentioned previously as well. The sands are quartz. The sediments underlying, PS has mainly transgressive character. Towards the west and north-west Pod-Gyrmaky, Nad-Gyrmaky and Gyrmaky suites that lay on its ceiling becomes wedge-like gradually. Therefore, the major sediments lie on Diatom suites after passing Pont. [3]

Aghjagil, Absheron and IV period sediments covering PS can be noted as well. In the south-east of the peninsula and straight in the marine area, the total thickness of the sediment reaches 2500m. These consist of clays, in rare cases volcanic ashes, marl, sand, sandstone, conglomerate and cockle-shells. Absheron oil and gas bearing district covers the south-eastern part of the Greater Caucasus tectonically. Structures leading to Caucasus are observed only in the northern part of the area. It should be noted that, sediments here are the hereditary continuation of the Paleogene and Neogene aged sediment structures. The folds of Absheron district are asymmetric; they have become complicated with a lot of disruptions and mud volcanoes. Some of these folds are in the shape of diapir. According to the distance among Kechaldagh, Bina and Shabandagh, Absheron oil and gas bearing district is divided into 3 zones: Western Absheron, Central Absheron and Absheron archipelago. [3]

Western Absheron zone as an extention of Central Gobustan fold consists of deep structured anticlinals towards the south-east. These folds are also linked with Bibiheybat field. Western Absheron upland zone is related with the Jeyrankechmaz zone from the south is associated with Pliocene-Anthropogenic aged IV period sediments.

Jeyrankechmaz zone is located in the south-west of Absheron and mainly surrounds Buta, Gushkhana and Lokbatan folds. It is oriented from Central Absheron zone to the north-east and sticks in the south-east of Gum Adasy.

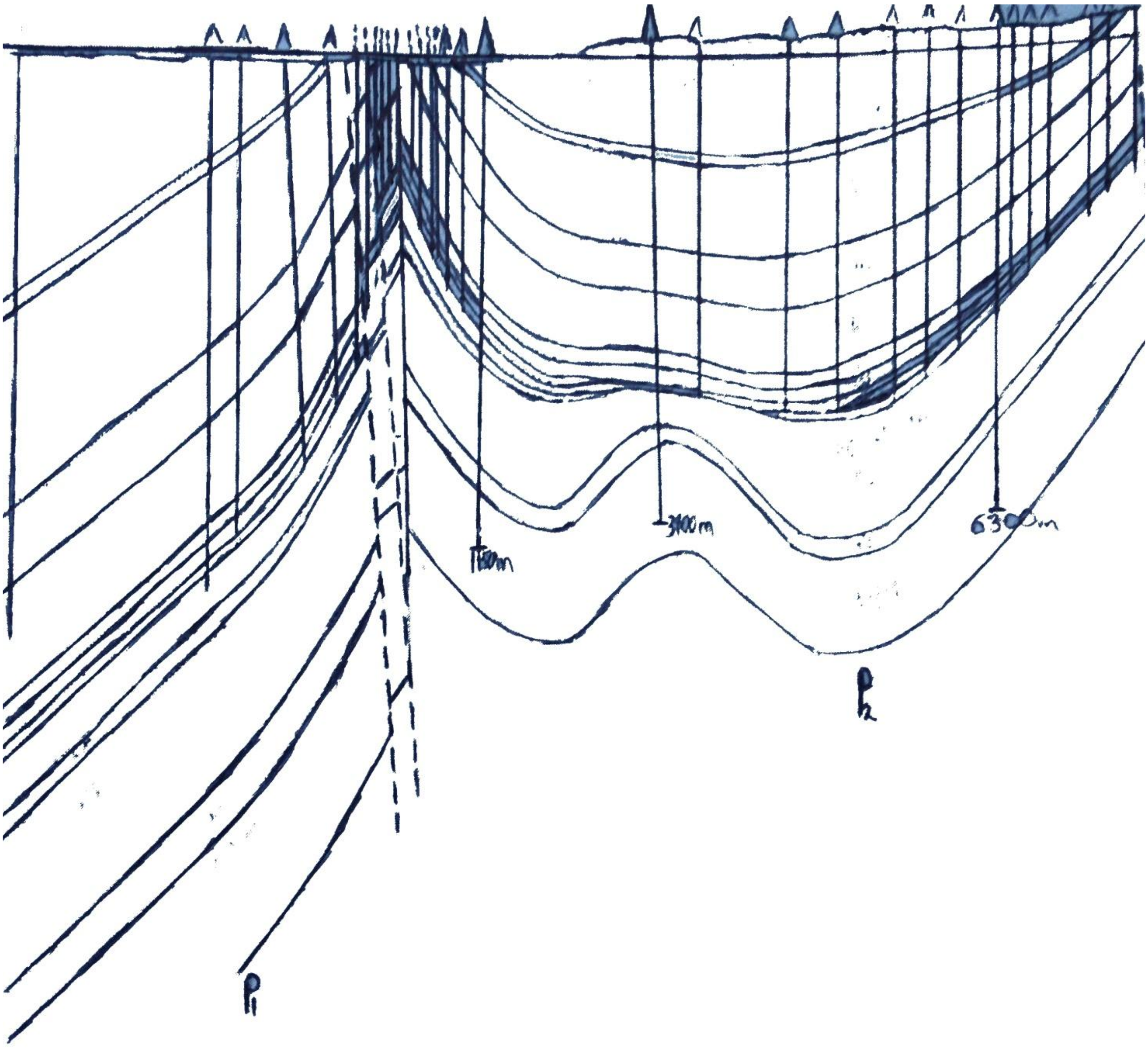

Figure 1. Cross sectional geologic profile of Western Absheron suite. (Aliyev & Afandiyev, 1990)

This anticlinorium is divided into four zones in the north-east. Oligocene-Miocene aged sediments exist in the nucleus of this zone. (Kechaldagh, Binagady, Saray, Jorat-Novkhany, Fatmayy, Gyrmaky). A large depression zone exists between the anticlinoriums of Central Absheron and Absheron Archipelago that called Eastern Sinclinorium.

Absheron Archipelago makes a large streak surrounds Absheron oil and gas district from the north-west, north-east and north and it covers a distance of 125 km from the north-west of Goshadagh to the south-east of Neft Dashlary. In Absheron OGEO, according to many morphological properties, individual fields are occurred. Such types of arched, tectonically and lithologically screened fields are compatible with the bottom of PS i.e. Pod-Gyrmaky, Gyrmaky, Nad-Gyrmaky suites. According to productive layer section and spreading character, gas collections are different. Maximal gassiness of gas-condensate fields is observed in Garadagh, in VII and VIII horizons, in Zira and South fields, in Nad-Gyrmaky and Gyrmaky suites.

Gases, which oil structure content belongs to productive layer's upper sections is noted over the oil in the shape of gas cap. Balakhany suites are observed in the south-west of Absheron peninsula, but Surakhany suite in the north-east of the peninsula. [3]

CHAPTER 2. SPREADING ZONES OF PLIOCENE RESERVOIRS IN SURAKHANY FIELD AND THEIR OIL & GAS PROPERTIES

Since ancient times, Surakhany oilfield has been well-known by its magic fires and healing oil. These were dealt with in the old legends and myths. The notes of Herodotus 2500 years b.c about sacred and permanent fire of Surakhany are known. Greek historian Kteziy has written remarks on “permanent fire” 2000 years before. A temple called “Temple of Fire” has been preserved in Surakhany up to these days. Since ancient times, people came here in caravan from India and Arab countries in order to worship the fire. Arab geographer L. Masudi wrote in the X century: “A state that called Baku and located on the coast of Caspian Sea is governed by Shirvan Kingdom. Here, volcano erupts to the earth, natural fires emit light, the oil gushes in nearby islands. In his writings, L. Masudi gives information about Surakhany white oil. While being in Baku in 1684, the member of Swedish Embassy, physician Kaempfer described such a view: “The flame coming out from the bowels of the earth covers and lightens the surrounding area. People dry household things made from the clay by putting them near the fire and some of them make a meal for workers on that fire. A short distance away, they burn limestone and take them to sell by loading into the boats”. Afterwards, in 1770 academician Gmelin, in 1860 academician Dorn, in 1842 Professor at the University of Kazan, Berezin and other scientists visited Surakhany, observed and kept records on its marvelous nature, rich oil and gas resources and people living here. Only at the beginning of the XX century, oil and gas fields of industrial importance were discovered here and their operation was started [2]. Surakhany field development was started later compared to the other fields of Absheron peninsula. Its main reason was that the drilling work was conducted outside the oilfield and couldn’t reach to desired depth. In the period until the first time of development, Surakhany field was considered to be a gas field. But oil-bearing capacity of this field was detected for the first time on August 24, 1904 by obtaining the oil from Aghjagyl level sediments at a depth of 211m through the well № 73204/445.

However, in spite of multiple oil and gas manifestations in the field, its development was started later compared to the other field of Absheron peninsula. The major cause was that, the wells drilled in the field area were non-productive because the wells were not deeply dug or drilled outside the oil-bearing area. It was expected to be as gas field, because the drilled wells were also producing a gas. But D. V. Golubyatnikov supported the existence of this field both as gas field and oil-bearing.

The most oil was produced from horizon and layers of upper section of the PS. The most productive sediments of upper section in terms of oil content are Sabunchu suite. “S” layer, in the Surakhany suite of upper section of the PS, III including III-IV layers in Sabunchu suite, V horizon in Balakhany suite are more productive objects. [2]

The most productive objects of lower section of the PS are II and I horizons of Nad-Gyrmaky suite (NGS).

Although the Surakhany oilfield is an old field, it has great prospects now and the future exploration work, will be of great help to Republican oil workers in performing a duty standing in front of them to increase the oil production depending on the result of scientific-research work to be conducted in such fields.

Generally, it can be concluded that, currently Surakhany oilfield should be considered to be one of the productive fields to increase oil production in Republic. The issues such as analyzing of both historical and geological-geophysical datas related to the field, spreading condition of basic suites of productive layer sediments and their involvement into exploration, physical and lithological character of oil-gas bearing object, reservoir properties of rocks and variation method according to the field area, analyzing of division of both lower and upper section of PS into operational object, calculation of the oil-bearing object measurement and propagation character according to the field, investigation of geological structure of the field on the upper and lower sections of Surakhany suite’s PS, oil and gas bearing of sediments of the PS, determination of the oil traps’ boundaries, existence of new oil traps were dealt with, most of the, were specified further and as a result of complex resolution of all these issues, the recommendations and proposals were made on for geological and exploration work to be conducted in Surakhany oilfield area for increasing oil production.

In brachyanticlinal fold area of Surakhany, all the strata (excluding NGS 3 stratum) of lower section of the PS beginning from Absheron level water has oil-bearing capacity. There is oil content in the Absheron level sands as well as oil and gas bearing capacity in volcanic ash, sandy strata of Aghjagyl level. Oil and gas bearing capability of Absheron and Aghjagyl levels is associated with the western and partly with southern part of fold arch. Oil-bearing capacity of Absheron sediments was determined on September 1905, by production of oil from well № 7735 in Surakhany fold area, in its western flank. The well operated 8 days in all. Afterwards, the same well was deepened up to the “B” stratum. For the first time the well № 7690 from Absheron sediments produced an industrial important oil. In September 1929, this well was put into operation with daily oil production of 2 tons and $9m^3$ water at a depth of 190-207m. During the operation period, this well produced 6000 tons of oil and $7859m^3$ and was suspended on April 24, 1951 with daily production 0.1 tons oil and $59m^3$ water. In all period of Surakhany field’s operation, oil-bearing capacity of Absheron sediments was checked through 5 wells and only the well № 1690 produced oil. [11]

Oil content area of Aghjagyl sediments is equal to the area of Absheron sediments and this area covers western flank, arch and partially southern part of the fold. On July 1904, oil was produced from well № 73204, Aghjagyl sediments located in the western flank of the fold. The well, with 35 tons daily production, had white oil gusher from 211m. By mid of January 1905, 1520 tons oil were produced from well and subsequently, the operation of well was ceased and revoked. In 1907, the well № 7532 gushed from the depth of 197.8-201.3m, Aghjagyl sediments with 15 tons daily production. Until 1921, 4319 tons oil were produced from that well and afterwards it was revoked. In 1907, another well (well № 6140) began to produce the oil from Aghjagyl sediments. In 1905, the wells № 7602 and 7735 were drilled in Aghjagyl sediments. The first well produced a gas during the test period, subsequently, it was deepened up to the lower layers and the second well operated for 8 days. In the all development period of the Surakhany field, 5 wells was in the operation and during the operational period 1000 tons oil were produced from

Aghjagyl sediments. Test work has not been out in Aghjagyl since 1921 up to the present time.

Sandy collectors of productive series are characterized by their oil-bearing capacity. Oil and gas bearing properties were recorded at about 100 strata and layers in Surakhany field area, but all of them were combined into 47 oil-bearing object of industrial importance with large and small volume and then became 29 object.

According to the obtained information, until the present time the gradual expansion of oil-bearing area to the IV, IVd, IVe and V horizons, which are considered to be objects of the PS' IV horizon, is observed. Beginning from the V horizon, the oil-bearing area decreases in upper section horizons of PS at the lower levels on stratigraphic division. The smallest oil-bearing area was recorded at the VIIIa stratum and the IX horizon. [2]

The oil-bearing areas of Pod-Gyrmaky clay suite (PGCS) and PGCS of the lower section of the PS expands again, but these areas are smaller than the oil-bearing areas of IVs, IVd, IVe and V horizons.

The oil-bearing fields of upper section of PS cover the arch and parts around the arch of fold. While investigating the geological structure and tectonics of Surakhany, it was noted that, the arch and parts around the arch of fold divided into tectonic blocks by failles in longitudinal and diametrical direction on the upper section of PS. These blocks played a regulatory role in the formation and maintenance of unique oilfields at upper section sediments of Surakhany fold's PS.

The oilfields of lower section sediments of the PS differ from oilfields of upper section horizons and strata. Thus, the oil-bearing capacity of lower section sediments of the PS of brachy-anticline is associated with its main east, south and south-east flanks. Western flank and arch part of the structure are not oil-bearing. Oil-bearing capability of Gala suite is associated with the full eastern flank of fold. All these are explained by the disorders of eastern flank of the lower section of PS and are connected with the dependence of oil bearing capacity of sediments from separate blocks sometimes with the emergence of shielded oilfields.

Oil-bearing capability of upper section of the PS of Surakhany fold begins from its arch part. According to the stratigraphic division, A, A-B, B, C, C-D, D,1 and 1’ strata and horizons of Surakhany suite, which is the upper section of PS, are considered as an oil-bearing. We consider it necessary to note some information concerning the upper strata. Thus, in 1905, a gas was obtained from the bottom of PS in the well № 7602 and as a result of this, the foundation of oil-bearing capacity of Surakhany suite was laid. In 1906, the well № 73200 produced oil from stratum “B”. In 1907, “red” oil was obtained from stratum “S” in Surakhany fold area. [2]

The development period of oil-bearing strata of Surakhany suite covers 1905-1912 years. The I and II horizons of this suite included processing in 1940. Oil in Surakhany suite was expected to run out of and due to this reason the exploitation of oil-bearing strata of this suite was ceased from 1921 to 1939. In 1939, drilling was restarted and residual oil was specified at A-B, B, S-D and D strata. Re-processing of oil-bearing objects of Surakhany suite was started since 1956. During this period the oil reduction and water cut were observed in oil-bearing facilities. The most productive oil-bearing facility of Surakhany suite was “S” and the least productive one was “A” stratum. Generally, Surakhany suite’s oil-bearing strata covers the separate blocks. They have small areas and their operation occurred with intervals. As a result, productivity of these strata decreased and their water cut occurred.

The largeness of the Surakhany fold’s II horizon compared to the I horizon is clearly observed in the structural map compiled according to bottom of the II horizon. The oil-bearing capacity of this horizon lies to the south part beginning from north-west part of the fold diverged from its Balakhany-Sabunchu-Ramana structure covering its arch part. Some wells (№ 754, 723) in the block located in the arch part of the fold produced gas and this is compatible with geological structure and tectonics of the fold. [2]

According to its oil-bearing properties, the IV horizon is divided into the IV, IVa, IVb, IVc, IVd and IVe strata. Although the data collected on oil-bearing capacity of each stratum, there is not an opportunity for their interpretation separately. By analyzing propagation characteristics of oil-bearing areas of these horizons, it can be concluded that the reserve areas may exist in terms of oil bearing capability and it should be paid attention.

The oil-bearing capability of the V horizon was determined by the gush of wells № 7302/67, 7538/26 and 7566/125 in 1925. In 1926-1931, oil production increased due to the drilled wells in the V horizon and rich oil facility of this horizon was determined. Then the drilling was carried out in this facility and its oil-bearing contour increases. The comparison of oil-bearing areas of the V and II horizons shows that, these areas are approximately equal, located at the same blocks and oil-bearing capacity of the V horizon is limited by disorders and regulations.

In 1929, the VI horizon's oil-bearing capability was discovered through the exploration wells № 75195 and 1792. Both wells gushed oil by 100 tons daily production. In 1930 and 1931, oil production of the VI and V horizons almost became equal. During the development period 20 million tons oil were obtained from both horizons. Oil-bearing reservoir of the VI horizon is related to the main arch part of fold and from the well area № 1672 in the northern part of fold and lies to the southern part and is closed in the well area № 1024. The determination of VII horizon's oil-bearing capacity was occurred mainly through the wells drilled from the lowest horizons. According to the obtained information, the oil-bearing area of the VII horizon lies to the south by covering arch part of fold in the form of stripe. [11]

The comparison of the oil-bearing areas shows that the VII horizon's oil-bearing area is smaller than the oil bearing areas of the upper oil bearing areas.

The oil-bearing capacity of the VIII horizon was detected through the wells drilled to PGCS in 1930. The oil-bearing area of this horizon has a small size and it almost covers the central part of the arch part of fold.

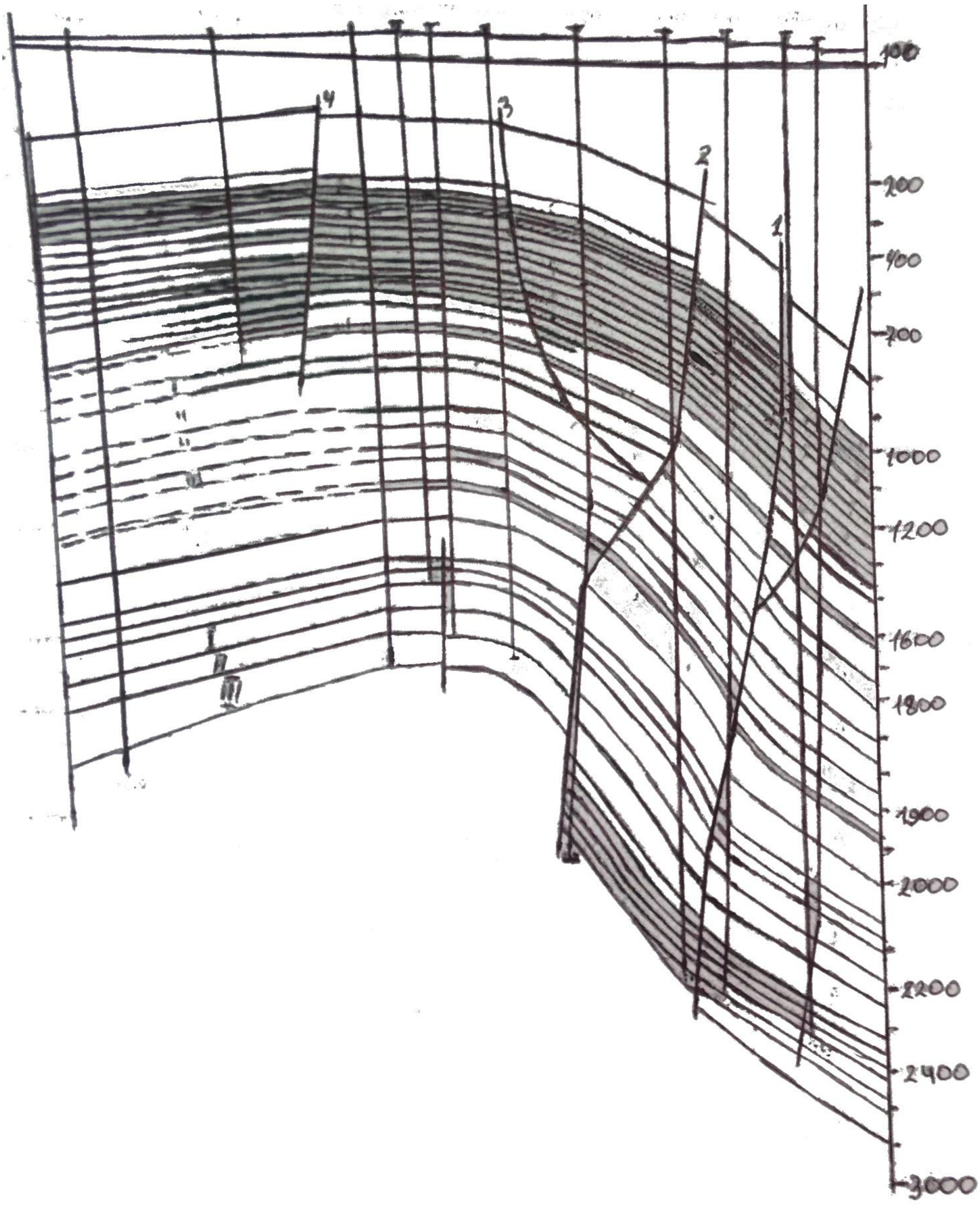

Figure 2. Geologic profile of Surakhany field (Alizade & Akhmedov, 1967)

In 1930, the carried out exploration work to PGCS gave positive results and oil production from the wells № 179 and 351 created an opportunity for inclusion of the same horizon into the operation. During the drilling work in this horizon the oil-bearing capacity of the VII, VIIa and IX horizons was determined. The IX horizon put into operation mainly due to the returned wells operated with high production and became early water cut. From the oil-bearing map of the IX horizon compiled in accordance with the currently obtained information, it is clearly seen that, its oil-bearing area covers the arch part of fold.

Thus, the oil-bearing area of the IX horizon is smaller than the oil-bearing areas of other horizons of upper section of the PS.

Thus, the comparison of oil-bearing areas of Surakhany fold according to the upper section horizons of the PS shows that, this area expands from top to the V horizon and oil-bearing area decreases from V horizon to the IX horizon. The X and Pereriv suites, which constitute the lower horizons of the upper section of PS, don't have oil-bearing capacity. However, during the reference log analysis of the wells the positive properties of Pereriv suites in some wells is noticed. The well № 1760 and others can be shown as an example. For this reason, the issue can have a great importance in the future. [2]

It should be noted that, the structures of the V-IX horizons are compatible with the PGCS of lower part of the PS and that's why, the oil-bearing issue of these horizons was solved on the PGCS structure basis.

It should be pointed out that, the difference is observed in the geological structure of Surakhany field in terms of upper and lower section sediments of PS. That difference also played its role in the placement and spread of oil and gas. Thus, the oil-bearing capacity of upper section strata and horizons of PS are associated with the main central part of fold, but the oil-bearing capability of the lower section horizons mostly covers east-south, south-east flanks of the fold. In 1933-1935, the oil-bearing capacity of PGCS was determined, as a result of wells drilled in PGCS. In subsequent years, five oil strata were detected in this suite. The oil-bearing capacity of PGCS covers the arch part of the fold, which compatible with the structural map compiled according to the bottom of PGCS.

In 1935 and 1936, the oil-bearing capacity of Gyrmaky and Nad-Gyrmaky was detected in area around the arch of fold and mostly in its south-east block. The oil-bearing capacity of Gyrmaky and Nad-Gyrmaky suites were detected around the arch and mostly in its south-east tectonic block in 1935-1936.

In 1951-1975, two exploration wells were drilled in Surakhany structure. One of them is the well № 1615 drilled for determining the oil-bearing capability of Gyrmaky suite in 1955 and was put into operation with 23.4 tons daily production by opening the III horizon of Gyrmaky suite. The well № 1448 was drilled mainly for the determination of oil-bearing capacity of Nad-Gyrmaky suite. However, after determining the oil-bearing capacity of these sediments in the well area, the well was returned to the GLS III and initially gas, then oil were obtained. In 1964, the well with 0.4 tons daily production was taken out of operation due to the technical reason.

Oil-bearing area of the Gyrmaky suite I relatively covers the arch part of fold. The expansion of oil-bearing area of the Gyrmaky suite II partly to the east part in comparison with the oil-bearing area of horizons laying over this suite is observed.

The oil-bearing capacity of Nad-Gyrmaky suite (NGS) sediments was detected through the wells drilled around the arch of Surakhany fold and its south-east block in 1935-1936. One of the two wells (№ 1448) drilled with the aim of exploration in Surakhany fold area in 1951-1975. NGS fully opened and the oil-bearing capacity of that suite sediments was determined in the well area. During the operational period of Surakhany field, the positive result of wells drilled in the suite caused to the expansion of oil-bearing area. Three wells № 1853, 1937, 1938 drilled in 1993 accounted for NGS and they were put into commission by producing oil from the NGS D1, NGS D2, NGS D4-5 horizons. [2]

Oil-bearing areas of the NGS 1and NGS 2 cover the east flank of fold.

NGS 3 is considered to be aquifer, because during tests all the wells supplied water from the sediments. So, there is no further need to comment about it.

Oil-bearing capacity of the NGS 4 is also mainly associated with the eastern flank of fold.

Oil-bearing area of the NGS 5 is smaller in comparison with the other horizons.

Thus, summarizing the issue of oil-bearing of the NGS, it is necessary to mention that its oil-bearing is related to main eastern flank of the Surakhany fold and in terms of oil-bearing NGS D1 and NGS D2 have a larger area.

Oil-bearing of sediments of Gala suites in accordance with the spreading character of these sediments is related to the south-eastern flank of fold. It is necessary to mention that the structure, constructed in accordance with the bottom of the Gala suite, due to the map disorders is divided into certain blocks. Oil-bearing of sediments of the Gala suite is mainly related to the blocks laid in the southern part of the eastern flank of fold. This fact confirms the existence of the disorder once again and regulates the oil spreading.

Taking into account the analysis of information concerning to the geological structure, tectonics, oil-gas-water bearing character, geophysical-field and other qualities of Surakhany oilfield the following conclusions can be reached:

1. Analysis of geological and geophysical oilfield information concerning to Surakhany oilfield shows that there are still untouched oil-bearing areas in Surakhany oilfield and these areas are Gyrmaky, Nad-Girmaky and Gala suites, which are mainly considered as the base suites. It is possible to define oil-bearing areas in the upper sections of the PS as well. [2]

2. In the area of Surakhany oilfield changing of lithological characteristics along the area of PS section rocks constituting its oil-bearing part show that these indicators to the east, south, south-east and a bit to the north of the arch of fold get better from top to bottom (direction) of the section.

3. Thickness of suites constituting all the maintenance facilities, all known oil facilities in general increases along the field’s area from its center to east and southwards. In this case along the section from top to bottom (direction), this increase expands in the lower horizons relatively.

4. By analyzing the oil-bearing properties of upper section horizon of PS, it is determined that, the oil-bearing boundaries of upper section horizons of PS are regulated through the disorders spread in fold area. Consequently, it is necessary to consider from a new point of view to the distribution of the oil-bearing area in Surakhany oilfield.

5. According to the horizons of upper section of PS of Surakhany fold, comparison of areas of oil-bearing capacity shows that from top to bottom, up to the V horizon this area grows larger, but from V to IX horizon oil-bearing capacity decreases. X and Pereriv suites constituting lower horizons of upper section of the PS do not have oil-bearing. However, by analyzing of well logging diagrams in some oil wells, the presence of positive characteristics of Pereriv suite is felt. The well № 1760 and some others can be given as an example. Therefore, this issue can assume a great importance in the future. [2]

6. The comparison of the lower section fields of the PS shows that the III horizon of Gyrmaky suite and the I horizon of NGS both have the biggest oil-bearing capacity area.

7. It becomes clear from oil-bearing properties of Gala suite that the south part of the fold should attract more attention.

CHAPTER 3. THE EFFECT OF MAGNETIC DEVICE TO PRODUCTION WELLS

It is necessary to state that it is possible to struggle against formation of hydrate by application of the physical areas. One of the most rational reagents applied against formation of hydrate is methanol. However, this reagent is not produced in our republic and as its application is not allowed from ecological health point of view. Nowadays iso-propanol is suggested for struggle against formation of hydrate in Azerbaijan petroleum industry. Application of iso-propanol is not favorable from economical point of view. Thus, its price 700 USD per ton.

Besides decrease of utilization of the chemical reagents, application of physical areas is the means applied against formation of hydrate either. [9]

As a result of application of magnetic fields on the top and bottom of wells, it is possible to increase production. Decrease of hydraulic losses during flowing of fluids through the pipelines is set as a problem in front. The investigations were implemented at the compressor wells (R-lift) of Surakhany OGEO.

The magnetization scheme of well (1) was shown on Figure 3. Magnetic device is installed on (3) crossbeam lines in the special chamber. The tension of each stable used magnet is 600 A\m in the device. Antimagnetic thimbles made from non-magnetic material are installed between the magnets located consistently on the poles of same one.

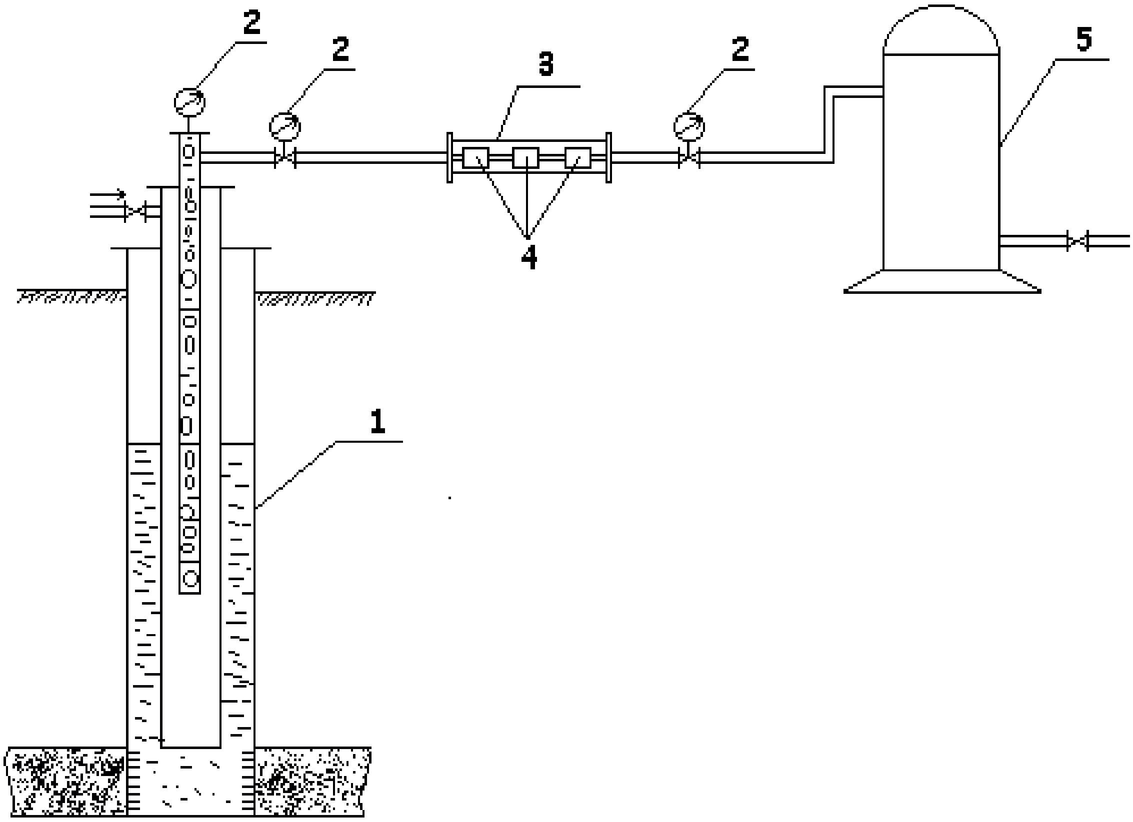

Figure 3. Scheme of magnetic device application

After having installed the magnetic device on the line, the yield of the well is measured on the measuring ladder from time to time (2). (2) are model manometers. [9]

The magnetic devices are installed in the wells № 1836, 1947, 1764, 1862.

Spending of working agents injected in the result of magnetic devices installed in the wells was decreased 20-25%, yield of wells was decreased averagely 20-25%. It shows that the ability of discharge of the pipelines inside the mine increases in the result of effect of fluid flow of magnetic field. At this time, decrease of expenditures spent on repulsing of the resistance force to the fluid flowing on the crossbeam lines contributes to more rational utilization of potential energy spend on lifting of fluid from the bottom of the well to the mouth of the well.

Before and after installing the magnetic device on the well № 1947 curves of daily yield dependence on time are shown in Figures 4 and 5. [9]

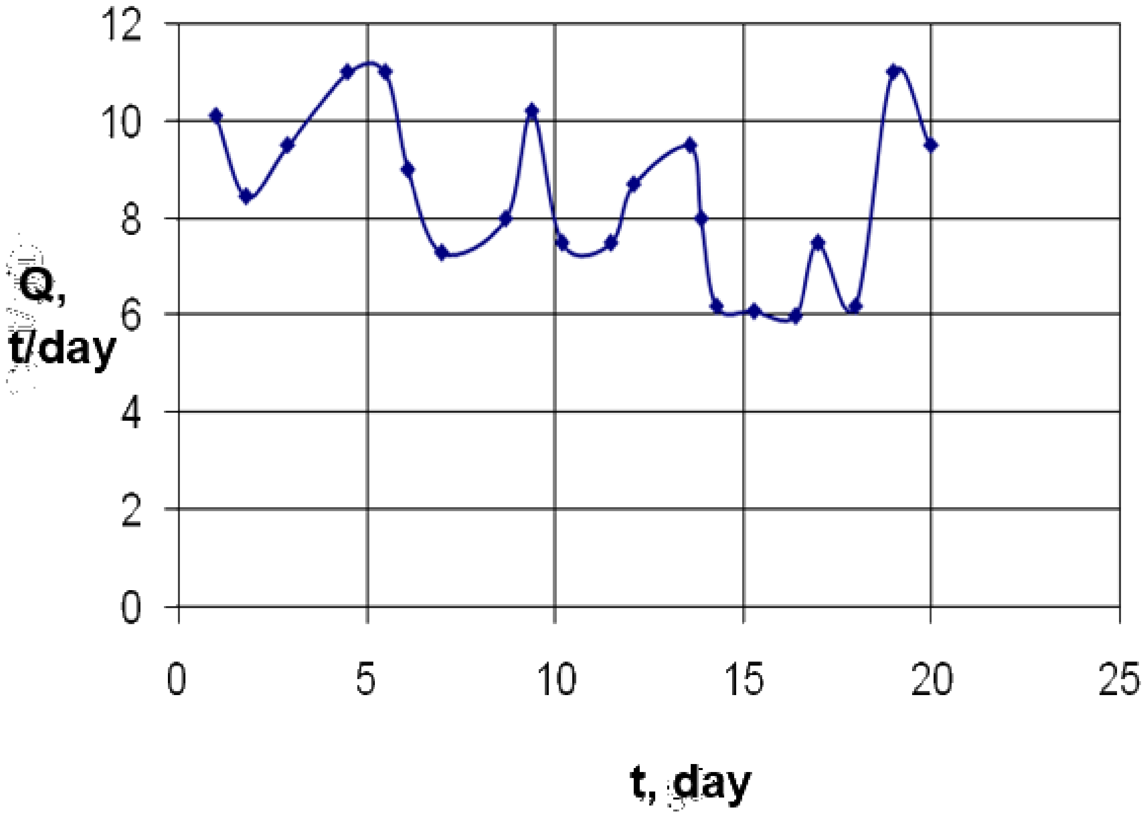

Figure 4. Curve of daily yield dependence on time

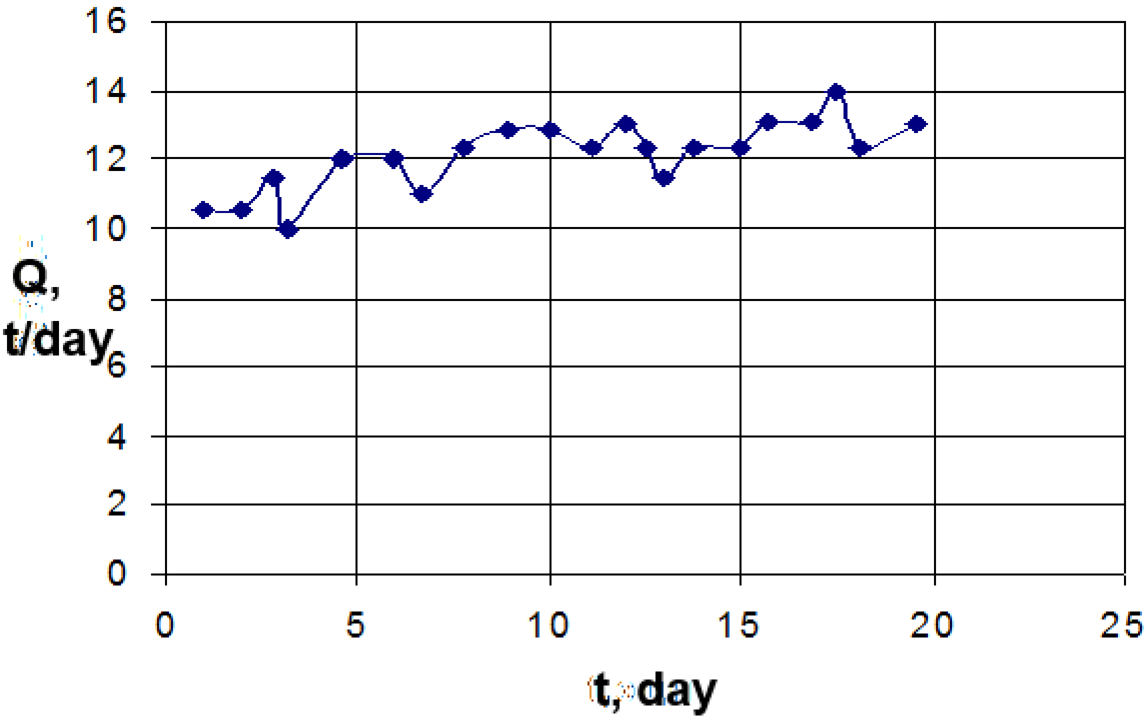

Figure 5. Curve of daily yield dependence on time

The comparison of Figures 4 and 5 shows that the fluctuations of the well’s yield were decreased after having installed the magnetic well. Therefore, the beats of the well on the zone of the bottom of the well were decreased, sand formation was relatively prevented. Weakening of the fluctuations of yields after having applied the magnetic devices in the compressor wells was proves by the values of Tale criteria i.e., as the value of Tale criteria was 0.0094 upon the dynamics of fields till installation of the magnetic device, this value was 0.04 after having installed this device. [7]

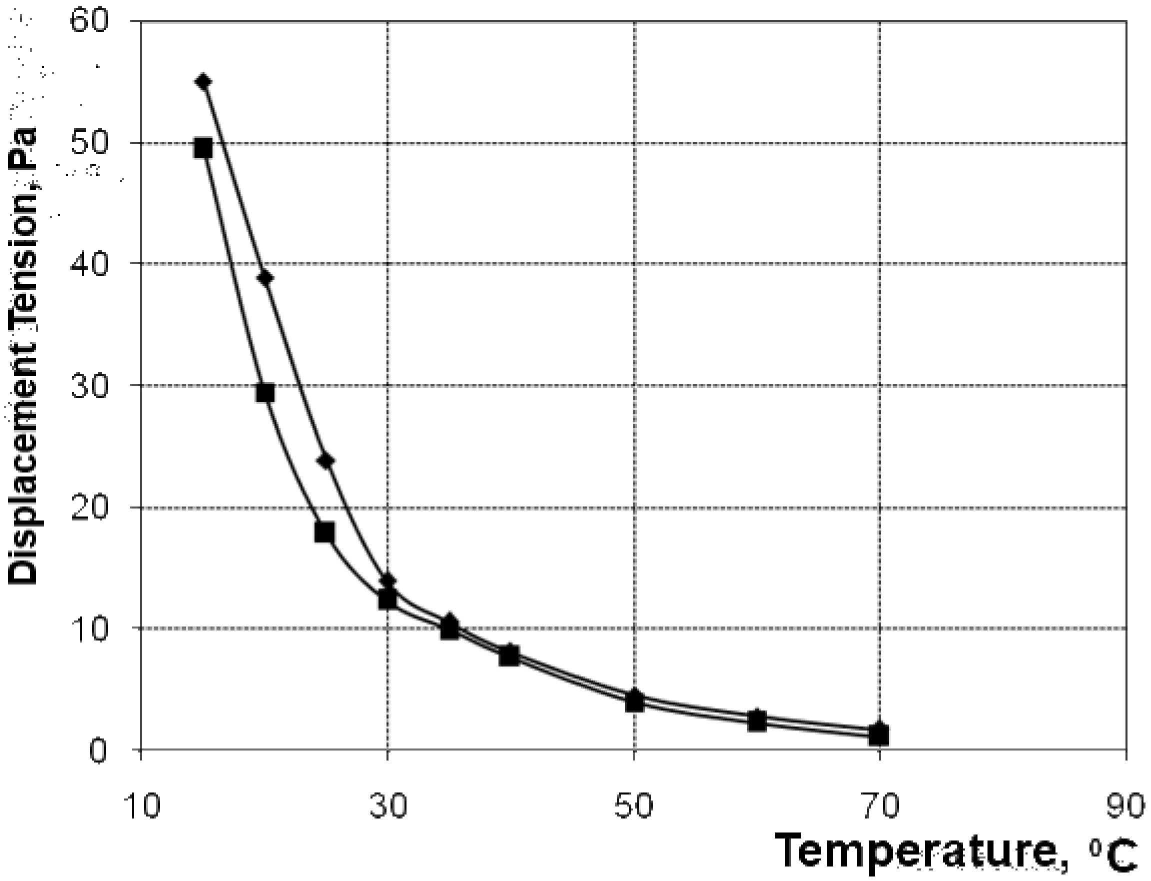

Figure 6. Curves obtained between displacement tension and temperature after the effect of magnetic field on high paraffin oil

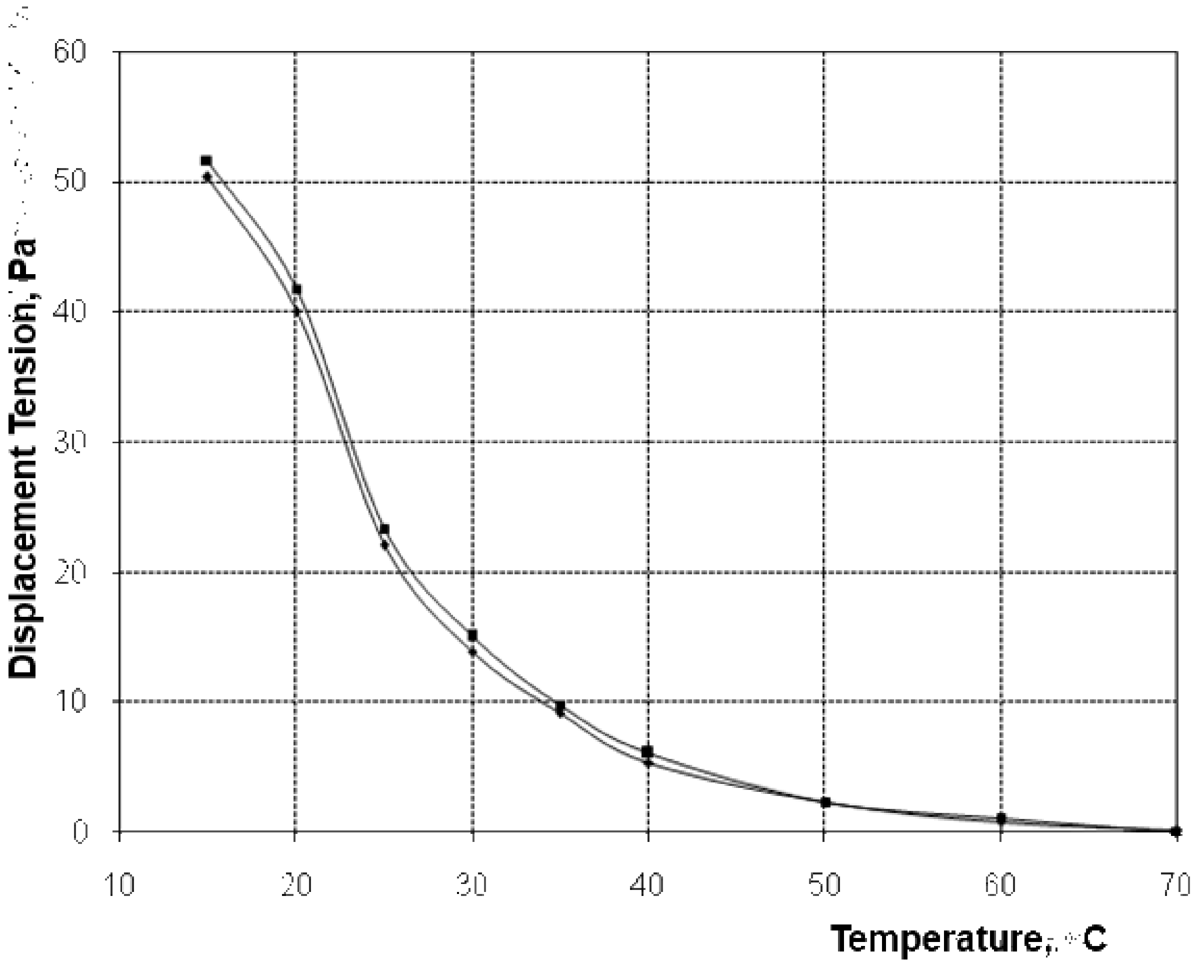

Figure 7. Hysteresis curves at different temperatures while exerting influence by the magnetic field on high paraffin oil (γ=const.)

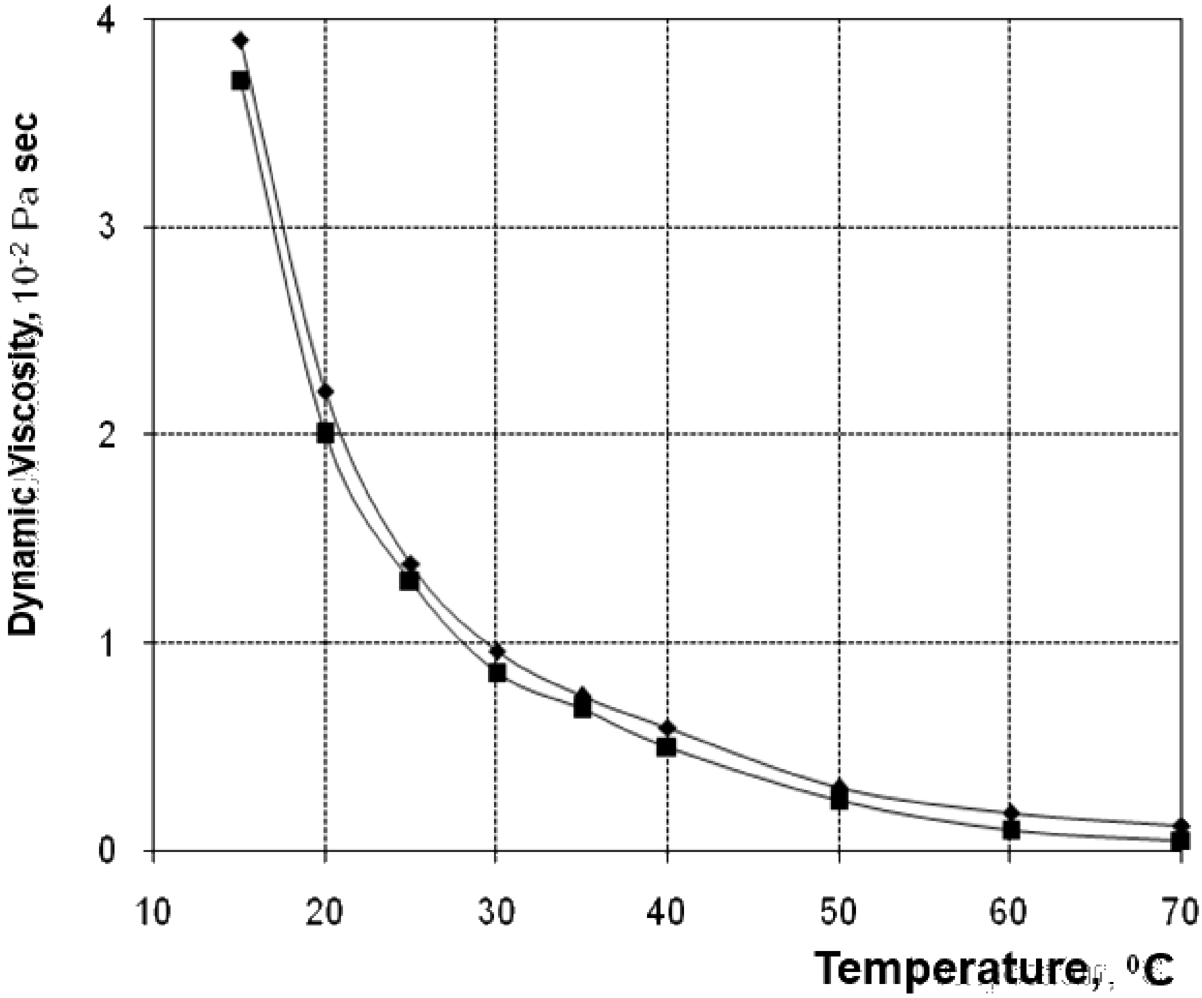

Figure 8. Dependence between the basis and temperature while exerting influence by the magnetic field on high paraffin oil (γ=const.)

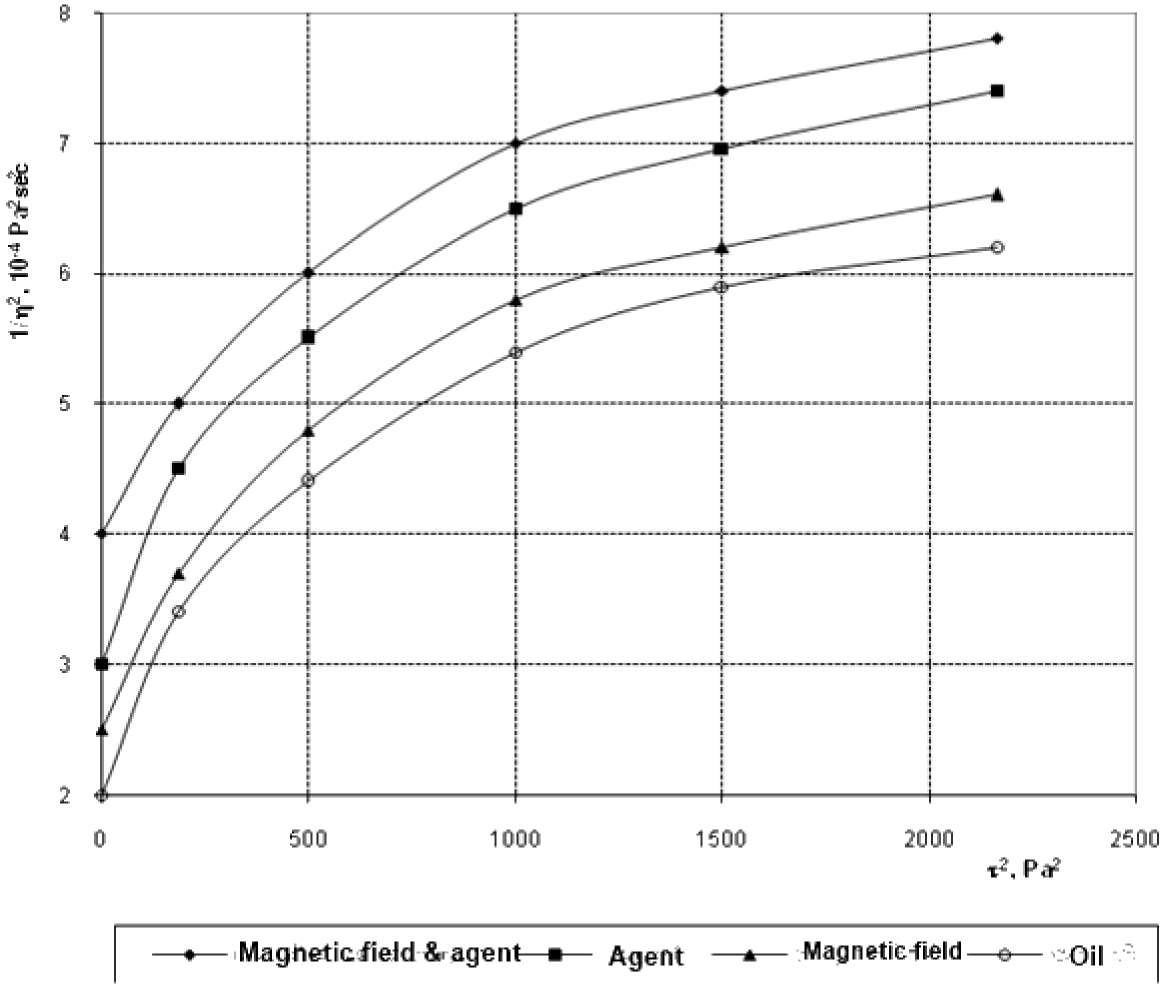

Figure 9. Dependence between the square of reverse value of dynamic effective basis in oil rich with paraffin and square of displacement tension

After having exerted influence with magnetic area at highly paraffined oil, we witness decrease of basis depending on temperature at the stable sliding speed. It is seen from the graphic of dependence between the basis and temperature while exerting influence by the magnetic area on highly paraffined oil that the reverse value of the basis increases as the sliding tension increases. The reverse value of the basis at raw oil without reagent is lower a lot than the value exerted influence by magnetic field. [6]

Table 2. Depressastors at the different displacement speeds

Type of depressator at magnetic field and non-steadiness coefficient α	Displacement speed, sec^{-1}						Total non-steadiness coefficient
	48,6	81,0	145,8	243	437,4	729	
Without agent	0,271	0,224	0,222	0,179	0,123	0,119	116,18
Magnetic field	0,205	0,225	0,216	0,176	0,120	0,110	112,78
Composit-2	0,233	0,164	0,082	0,049	0,027	0,018	42,96
Magnetic field and Composit-2 agent	0,230	0,160	0,079	0,043	0,024	0,015	40,92

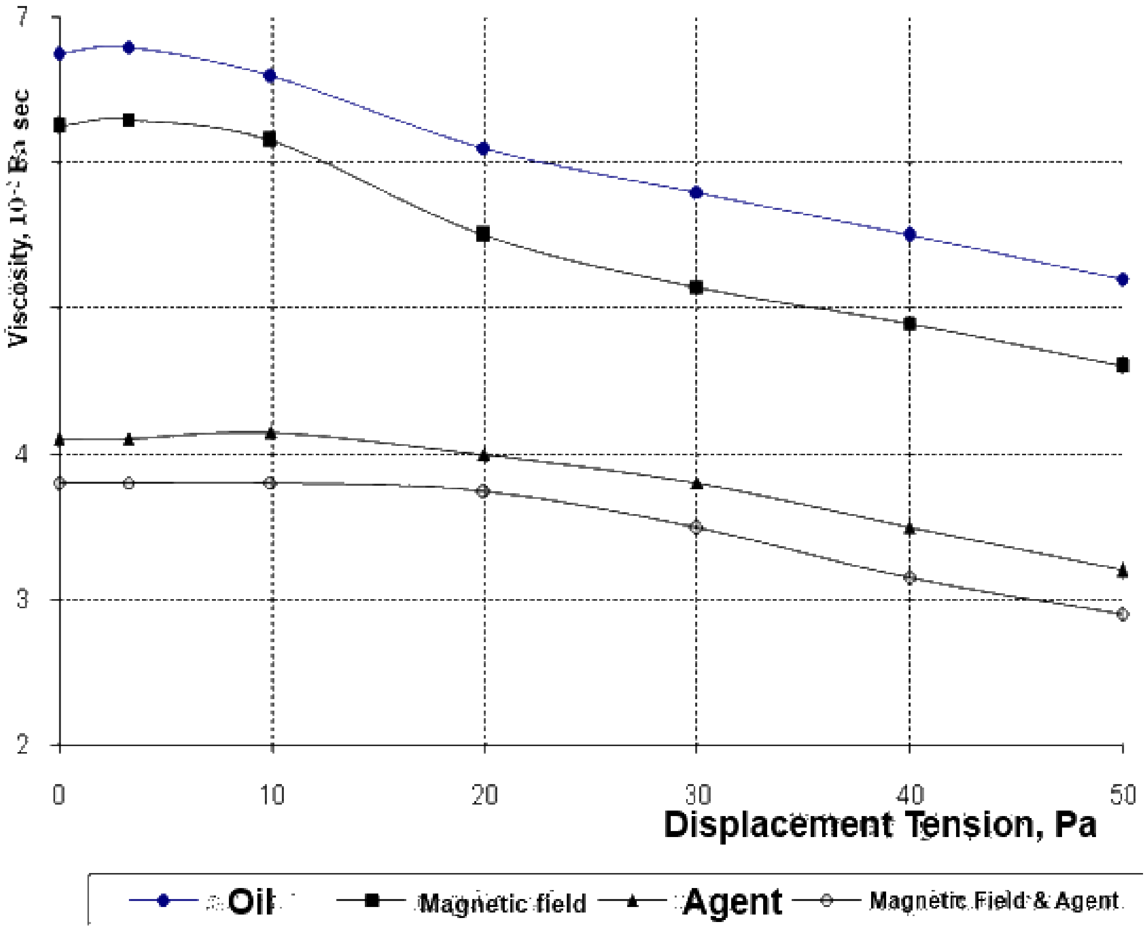

Figure 10. Dependence between the basis and sliding tension after having exerted impact on oil with rich paraffin by the magnetic field

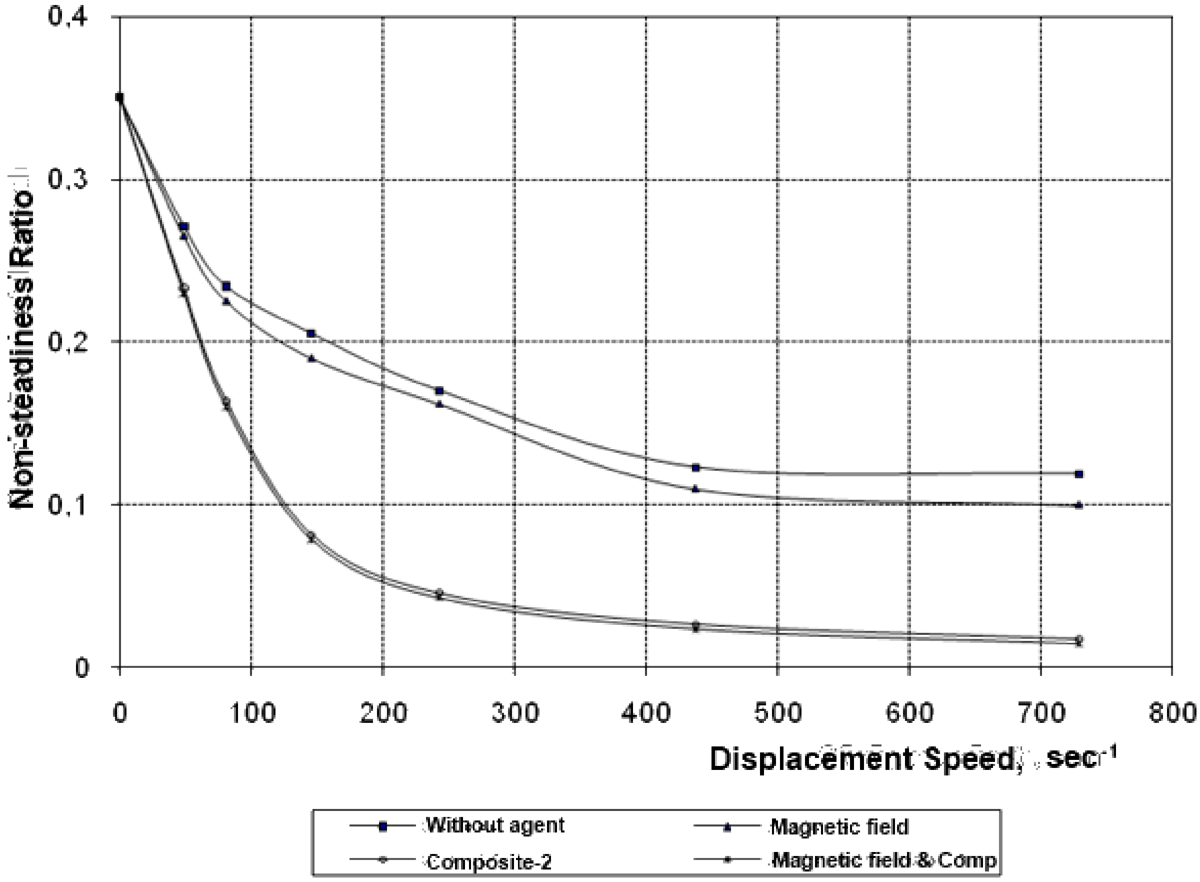

Figure 11. Dependence between the displacement speed and non-steadiness ration after having exerted effect on oil with rich paraffin by the magnetic field

Table 3. Values of non-steadiness ratio after having located in the magnetic fields of paraffined oil developed by the different concentration's chemical agents (т=14-16°C)

Indicator of spending of oil developed in the magnetic field	Displacement speed, sec^{-1}					
	48,6	81,0	145,8	243	437,4	729
	Non-steadiness ratio, α					
6 l/t	0,240	0,199	0,086	0,075	0,069	0,064
7 l/t	0,230	0,161	0,079	0,043	0,024	0,015
12 l/t	0,245	0,208	0,108	0,100	0,094	0,092

It is seen from the Table 3 that as the value of displacement speed increases, the value of non-steadiness ratio decreases, that is to say that the crystal structure of paraffined oil begins to be destroyed and oil steadiness tries to get the case. After having added depressator to high paraffined oil, local crystal center getting in weak touch with each other and making hindrance in formation of crystal structure of paraffin combinations is formed. Thus, while placing depressators in the magnetic area together with oil, the system is put in steadiness form by decreasing its non-steadiness. [12]

Total values of non-steadiness coefficient of oil rich with high paraffin developed with chemical reagents in the stable value of sliding after impact of the magnetic field is given in the figure.

Table 4. Effect of chemical agents of different thickness and non-steadiness coefficient of the magnetic field on the total value

Total value of non-steadiness ratio	Without agent	Magnetic field with agent		
		6 l/t	7 l/t	12 l/t
	116.18	63.73	40.92	78.76

As it is seen from the Table 4, as the value of steadiness coefficient for raw oil is 116.18, it is 63.73 and 40.92 in 6 l\t and 7 l\t of the chemical reagent accordingly in the magnetic area.

These results were both proved by the laboratory investigations and hydraulic calculations. Thus, after having worked out highly paraffined oil by the magnetic field and chemical reagent, appointment of non-steadiness coefficient based on the steady and unsteady flow curves contributes to appointment of the optimal contraception of the depressator in the magnetic area. The lower value of steadiness corresponds to the optimal density and shows optimal spending norm of the depressator.

The investigations show that while exerting impact on oil with paraffin by the chemical reagent, the amount of paraffin settled on cold fingers is 7 g, it is 6.85 g while exerting impact by the magnetic area and it is 6.7 g during joint impact of the magnetic area and the chemical reagent. In the case of non-impact, this value was 10.41 g, the value of settled paraffin was increased 50%, 52% an 55% accordingly. Formation of synergetic effect in joint influence is seen here. In the result of implemented scientific-investigation the following results were obtained:

It was determined in the result of laboratory investigations that while exerting impact on oil with paraffin by changeable and stable magnetic area, its freezing time lengthens 33%. [8]

It was determined that while exerting influence on oil with paraffin by the magnetic field, the best effect is achieved in the maximum value of the amplitude and the minimum value of the frequency.

It was determined in the result of implemented experiences that as the period of storage of oil rich with paraffin increases, the impact effect increases either.

Joint impact of magnetic field and chemical reagents on oil with paraffin was investigated and it was shown that optimal spending of reagents was decreased from 10 l\t to 7l\t, i.e., it was decreased 43% and the impact effect was 55%.

In the result of the investigations, the existence of synergetic effect of joint impact of the magnetic field and the chemical reagent was determined.

Table 5. Results of the investigations upon appointment of the ability of conductivity in the crossbeam lines of wells

Wells' №	With Magnetic Effect					Without Magnetic Effect				
	P_{res}	P_b	ΔP	Q_w 11.57 10^{-6} m^3/sec	$Q_w/\Delta P$	P_{res}	P_b	ΔP	Q_w 11.57 10^{-6} m^3/sec	$Q_w/\Delta P$
	10^{-1} Mpa					10^{-1} Mpa				
1	2	3	4	5	6	7	8	9	10	11
	2.90	1.84	1.06	294	277.4	3.03	1.91	1.12	270	241.1
	2.92	1.84	1.08	297	275.3	3.05	1.91	1.14	279	244.7
	2.92	1.87	1.05	270	257.1	3.08	1.91	1.17	297	253.8
	2.90	1.88	1.02	297	291.2	3.05	1.87	1.18	300	254.2
252	2.96	1.89	1.07	297	277.5	3.07	1.86	1.21	303	250.5
	2.98	1.86	1.12	294	262.5	2.98	1.8	1.18	300	254.2
	2.90	1.77	1.13	297	262.8	2.98	1.89	1.09	297	272.5
	2.94	1.89	1.05	300	285.2	3.07	1.95	1.12	285	254.5
	2.96	1.83	1.13	294	260.2	3.06	1.85	1.11	273	245.9
	2.92	1.81	1.11	297	267.6	3.00	1.94	1.06	285	268.9
	2.92	1.81	1.11	295	265.8	3.00	1.95	1.05	290	276.2
	2.54	1.60	0.94	275	290.4	2.82	1.76	1.06	270	254.7
	2.50	1.58	0.92	270	293.4	2.8	1.75	1.05	261	248.6
	2.54	1.63	0.91	273	300	2.86	1.76	1.10	258	234.5
	2.52	1.61	0.91	276	303.3	2.78	1.77	1.01	256.5	254
	2.54	1.62	0.92	274.5	298.4	2.8	1.73	1.07	255	238.3
75252	2.54	1.64	0.90	276	306.7	2.82	1.74	1.08	256.5	237.5
	2.52	1.57	0.97	277.5	386.1	2.94	1.79	1.05	258	246.2
	2.48	1.59	0.89	271.5	305.1	2.80	1.70	1.10	259	235.4
	2.50	1.60	0.90	276	306.7	2.84	1.75	1.09	255	234
	2.52	1.62	0.90	275	305.6	2.90	1.82	1.08	252	233.3

1	2	3	4	5	6	7	8	9	10	11
	1.71	1.07	0.66	127.5	193.2	1.68	1.09	0.59	108	183.1
	1.70	1.03	0.67	132	197	1.80	1.18	0.62	110	177.4
	1.61	0.84	0.67	125	186.6	1.79	1.11	0.68	128	188.2
	1.59	1.01	0.57	132.5	232.5	1.78	1.15	0.63	115	182.5
	1.71	1.075	0.635	130	204.7	1.83	1.19	0.64	130	203.1
	1.72	1.091	0.629	130	206.7	1.78	1.13	0.65	118	181.5
	1.68	1.100	0.588	129	222.4	1.84	1.12	0.64	130	203.1
	1.75	1.140	0.610	132	216.4	1.83	1.17	0.66	125	189.4
	1.59	0.980	0.610	120	196.7	1.77	1.12	0.65	122	187.7
	1.77	1.146	0.633	126	199.1	1.77	1.12	0.66	126	193.8
	1.65	1.038	0.612	126	205.9	1.89	1.17	0.63	120.6	188.4
	1.74	1.21	0.53	110	207.5	1.77	1.16	0.61	108.3	177.5
	1.77	1.21	0.56	112	200	1.82	1.20	0.62	106	170.9
	1.77	1.23	0.54	109	201.8	1.79	1.21	0.58	108	186.2
	1.75	1.13	0.62	112	180.6	1.78	1.23	0.55	110	200
	1.73	1.17	0.56	110.5	199.3	1.76	1.16	0.60	107.5	180.8
	1.74	1.22	0.52	110.8	213	1.80	1.18	0.62	108.4	174.8
	1.75	1.21	0.54	109.5	202.7	1.81	1.21	0.60	109.2	182
	1.72	1.17	0.55	109	198.1	1.79	1.21	0.58	106	182.7
	1.77	1.20	0.57	108	193	1.92	1.21	0.71	105.8	149
	1.76	1.20	0.56	110.5	189.3	1.78	1.15	0.63	109	173
	1.74	1.19	0.55	110.8	210.4	1.77	1.15	0.63	107.3	173.1
	1.72	1.22	0.53	111	209.4	1.82	1.21	0.63	107	178.3
1568	1.73	1.21	0.52	109.6	210.7	1.80	1.14	0.66	109	165.1
	1.73	1.23	0.50	109	214	1.78	1.14	0.64	110	171.8
	1.70	1.22	0.48	108	225	1.79	1.14	0.65	108	167.7
	1.65	1.18	0.47	109.5	233	1.78	1.14	0.66	108	163.6
1	2	3	4	5	6	7	8	9	10	11

	1.70	1.20	0.50	110	220	1.80	1.14	0.67	108	161.2
	1.60	1.20	0.46	193.6	428.8	1.80	1.20	0.60	188	313.3
	1.66	1.18	0.48	186.4	388.3	185	1.23	0.62	189	304.8
	1.68	1.21	0.47	189	402.1	1.88	1.25	0.63	190	301.6
	1.70	1.13	0.57	189.5	332.5	1.83	1.21	0.61	186	304.9
	1.75	1.15	0.60	189	315	1.76	1.23	0.59	190	322
	1.73	1.17	0.56	192	342.8	1.88	1.24	0.64	189	295.3
	1.75	1.20	0.55	190	345.5	1.80	1.17	0.63	188	298.4
	1.80	1.80	0.50	189.4	378.8	1.84	1.22	0.62	191	308.1
	1.79	1.25	0.54	193	357.4	1.79	1.16	0.63	191	314.3
	1.83	1.23	0.60	193	321.7	1.80	1.15	0.65	191	293.8
	1.80	1.22	0.58	192	331	1.85	1.21	0.64	190	296.9
	1.80	1.20	0.60	125	208.3	1.82	1.16	0.66	125	189.4
	1.70	1.12	0.58	126.2	217.6	1.86	1.22	0.64	122.1	190.8
	1.75	1.25	0.55	127	230.9	1.84	1.21	0.63	120	190.5
	1.60	1.04	0.56	122.9	219.5	1.80	1.15	0.65	125	192.3
1378	1.65	1.15	0.57	125	219.3	1.85	1.17	0.68	127	186.8
	1.67	1.19	0.59	128	216.9	1.86	1.20	0.66	126.5	191.7
	1.70	1.24	0.56	129.2	230	1.84	1.20	0.67	127	189.5
	1.71	1.07	0.63	130	204.7	1.83	1.19	0.64	130	203.1
	1.72	1.09	0.63	130	206.7	1.78	1.13	0.65	118	181.5
	1.72	1.25	0.60	127.5	212.5	1.88	1.20	0.68	127.5	187.5
	1.75	1.21	0.59	130	216.8	1.85	1.15	0.70	130.2	186
	1.70	1.18	0.62	130.8	211	1.85	1.15	0.70	130.6	186.6
	1.68	1.10	0.58	129	222.4	1.84	1.12	0.64	130	203.1
253	1.75	1.14	0.62	132	213.6	1.83	1.17	0.66	125	182.4
	1.59	0.98	0.61	120	197.4	1.77	1.12	0.65	122	187.7
1	2	3	4	5	6	7	8	9	10	11
	1.65	1.04	0.61	126	205.9	1.83	1.17	0.65	125	189.4

	2.44	1.36	1.08	212	196.5	2.55	1.43	1.12	206	183.9
	2.45	1.39	1.06	210	198.1	2.62	1.42	1.20	208	173.3
	2.45	1.37	1.08	212	196.3	2.51	1.41	1.10	200	181.8
	2.45	1.40	1.05	213	202.9	2.48	1.36	1.12	206	183.3
	2.44	1.40	1.04	216	207.7	2.44	1.33	1.11	202	182.5
	2.46	1.42	1.04	207	199.1	2.54	1.41	1.13	210	185.8
	2.45	1.40	1.05	212	201.9	2.44	1.33	1.11	200	180.5
75253	2.42	1.35	1.07	214	200	2.45	1.34	1.11	148	180.5
	2.47	1.39	1.08	206	190.7	2.55	1.35	1.20	196	174.3
	2.43	1.37	1.06	211	199.1	2.44	1.34	1.10	204	183.9
	2.41	1.41	1.00	208	208	2.62	1.42	1.20	206	171.7
	2.43	1.38	1.05	205	195.3	2.50	1.33	1.17	200	170.9
	2.42	1.40	1.02	209	205	2.50	1.33	1.17	202	172.6
	2.50	1.44	1.06	212	200	2.57	1.45	1.12	207	184.8
	2.55	1.44	1.11	200	180.2	2.60	1.40	1.20	200	166.6
	2.56	1.50	1.10	208	196.2	2.58	1.45	1.13	204	180.5
	2.80	2.56	0.40	82.5	207.2	2.80	2.32	0.38	70.1	184.5
	2.70	2.32	0.38	70.6	185.8	2.85	2.30	0.55	70	127.3
	2.85	2.48	0.44	82.6	223.2	2.60	2.20	0.48	89.1	143.9
	2.70	2.30	0.40	82.6	206	2.90	2.32	0.58	72	124.1
	2.70	2.26	0.44	74.4	169.1	2.72	2.32	0.43	70.6	164.2
459	2.60	2.24	0.34	70.1	206.2	2.90	2.42	0.48	72.5	151
	2.60	2.28	0.42	75.5	179.8	2.95	2.40	0.55	71.5	130
	2.80	2.26	0.54	73.9	136.8	2.85	2.33	0.52	72	138.5
	2.70	2.30	0.40	73	182.5	2.80	2.30	0.50	71.9	143.8
	2.70	2.32	0.38	72.9	191.8	2.90	2.36	0.54	72.5	134.3
1	2	3	4	5	6	7	8	9	10	11
	2.70	2.28	0.42	73	173.8					
	2.70	2.28	0.42	72.5	172.6					

	2.35	1.40	0.95	233	245.3	2.55	1.39	1.16	231.1	199.2
	2.40	1.44	0.96	234.9	244.7	2.62	1.47	1.15	231.1	197.5
	2.33	1.37	0.96	233	242.7	2.50	1.43	1.17	233	199.2
796	2.45	1.38	0.97	238.8	246.2	2.48	1.29	1.19	230	197.5
	2.48	1.40	0.98	231.5	236.2	2.47	1.29	1.18	234	198.3
	2.32	1.37	0.95	234.5	246.8	2.50	1.30	1.20	233	194.2
	2.39	1.43	0.95	229.4	241.5	2.52	1.32	1.20	229	190.8
	2.45	1.45	1.00	234.9	234.9	2.60	1.40	1.20	231	192.6
	2.37	1.36	1.01	234.0	232.6	2.60	1.43	1.17	234	200
	2.32	1.35	0.97	234.5	241.7	2.60	1.44	1.16	233.4	200.9

Upon OGEO named after Narimanov

	8.64	8.20	0.44	81	184.1	7.76	7.30	0.43	78.4	182.3
	9.12	8.75	0.37	78	210.8	7.76	7.20	0.56	77	137.5
	2.36	8.96	0.40	83	207.5	8.18	8.62	0.56	72.6	129.6
	8.64	8.35	0.29	81	279.3	7.59	7.10	0.43	71.2	165.6
	9.12	8.77	0.35	79.3	226.6	9.44	8.97	0.47	76.4	162.5
	9.84	8.43	0.41	72	175.6	9.92	9.40	0.52	72.0	138.5
	9.60	9.15	0.45	76.3	169.5	9.90	9.37	0.53	76	143.5
43	9.84	9.55	0.29	72	240.8	9.24	8.48	0.66	76.4	115.8
	8.80	8.45	0.35	77	220	7.76	7.20	0.56	77	137.5
	9.84	9.55	0.29	76	262.1	9.80	9.20	0.60	80	133.3
	9.78	9.50	0.28	76.4	272.8	9.28	8.65	0.63	80	127

Upon Gum Adasy OGEO

	11.01	6.07	4.94	65.5	13.3	11.18	6.35	4.83	48.9	10.1
1	2	3	4	5	6	7	8	9	10	11
	11.15	6.34	4.81	63.9	14.1	11.38	6.22	5.16	56.2	10.9
	10.80	6.19	4.61	53.2	11.5	11.44	6.23	5.21	58.2	11.4

	11.04	6.12	4.92	57.8	11.7	11.41	6.26	5.15	57.3	11.1
	10.96	6.23	4.73	63.5	13.0	11.30	6.51	4.79	52.5	10.9
	10.06	6.11	4.95	56.5	11.4	11.20	6.03	5.17	56.2	10.9
369	11.24	6.23	4.96	58.1	11.7	11.19	6.25	4.94	47.5	9.61
	11.10	6.34	4.76	65.5	13.8	11.17	6.27	4.90	55	11.2
	10.90	6.35	4.55	69.9	15.7	11.10	6.28	4.89	50.5	10.3
	11.04	6.61	4.43	63	14.2	11.29	6.20	5.09	52.4	10.3
	10.99	6.34	4.65	70.6	15.2	11.37	6.25	5.12	53	10.3
	11.21	6.44	4.77	64.8	13.6	11.41	6.31	5.10	52.8	10.3
	11.08	6.57	4.51	63.7	14.1	11.65	6.50	5.15	56.6	10.9
	11.04	6.62	4.42	60.5	13.7	11.44	6.24	5.20	58	11.2
	11.14	6.89	4.25	58.9	13.9	11.34	6.12	5.22	58	11.1
	11.09	6.51	4.58	64.7	14.1	11.24	6.05	5.19	57	10.9
	11.16	6.19	4.97	70.1	14.1	12.29	6.33	5.96	59	9.9
	10.77	6.39	4.37	67.9	15.5	12.16	6.13	6.03	62	10.3
	10.96	6.44	4.52	64.5	14.3	12.20	6.22	5.98	60	10.1
	10.93	6.44	4.49	59.4	13.2	12.39	6.25	6.11	59	9.7
	10.07	6.50	4.57	59.9	13.1	12.63	6.27	6.36	60	9.4
	10.96	6.40	4.56	62.5	13.7	12.64	6.30	6.34	61	9.6
369	10.81	6.35	4.5	60.2	13.4	12.40	6.45	5.95	62.6	10.6
	10.77	6.19	4.58	59.4	12.9	12.19	6.35	5.74	62	10.8
	11.08	6.57	4.51	58.5	12.9	13.51	6.40	7.11	51	7.2
	11.19	6.90	4.29	58	13.5	14	6.44	7.62	62.6	8.20
1	2	3	4	5	6	7	8	9	10	11
	11.04	6.34	4.70	63	13.4	12.21	6.01	6.20	62.6	10.1
	11.03	6.61	4.42	61	13.8	12.20	6.15	6.05	62	10.2
	9.45	6.37	3.08	113	36.7	9.70	6.48	3.22	105	32.6
	9.35	6.32	3.03	109	36	9.68	6.50	3.18	109	34.3
	9.35	6.37	2.98	113	38	9.49	6.50	2.99	105	35.1

	9.35	6.68	2.67	105	39.3	9.50	6.45	3.05	105	34.4
	9.35	6.68	2.67	105	39.3	9.55	6.40	3.15	109	34.6
348	9.28	6.48	2.80	109	38.9	9.60	6.53	3.07	105	30.4
	9.38	6.48	2.90	113	39	10	6.55	3.45	109	31.6
	9.38	6.50	2.88	109	37.8	9.85	6.60	3.25	113	34.8
	9.60	6.67	2.93	101	34.5	9.68	6.58	3.00	101	33.7
	9.31	6.50	2.81	107	38.1	10	6.67	3.00	101	33.1
	9.38	6.48	2.90	109	37.9	10	6.70	3.30	101	30.6
	9.40	6.68	2.72	101	37.1	10	6.71	3.29	101	30.7
	9.40	6.40	2.72	113	37.7	10	6.73	3.27	109	33.3
	9.00	6.38	3.62	105	40.6	9.85	6.70	3.05	101	33.1
	9.00	6.40	2.60	101	38.8	9.87	6.68	3.19	105	32.9
	9.10	6.42	2.68	97	36.2	9.86	6.55	3.31	109	32.9
	9.75	6.40	3.25	113	34.8	9.68	6.55	3.13	101	32.3
	9.00	3.52	105	41.7	9.90	6.80	3.10	101	32.6	32.6
	9.00	6.52	2.48	109	43.9	9.98	6.80	3.18	97	30.5
	9.40	6.40	3.00	118	39.3	10	6.80	3.20	104	31.5
	8.00	6.89	1.11	47	42.3	8.20	6.80	1.40	46	32.86
	8.07	6.89	1.18	47	39.8	8.31	6.70	1.61	48	29.8
	8.00	6.80	1.20	50	41.7	8.26	6.70	1.56	46	27.6
	7.52	6.61	0.91	49	53.8	8.16	6.66	1.50	44	29.3
	7.85	6.72	1.13	47	41.6	8.09	6.71	1.38	48	34.8
1	2	3	4	5	6	7	8	9	10	11
	7.89	6.75	1.14	47	41.2	8.2	6.80	1.44	44	30.5
371	7.61	6.78	0.83	44	53	8.2	6.80	1.39	46	33.1
	7.85	6.45	1.40	48	34.3	8.2	6.79	1.50	43	28.8
371	7.52	6.60	0.92	45	48.9	8.2	6.80	1.46	45	30.8
	8.00	6.90	1.10	46	41.8	8.2	6.77	1.50	45	30
	8.00	7.04	0.96	44	45.8	8.1	6.75	1.40	46	32.9

	8.07	6.89	1.18	45	38.1	8.0	6.68	1.35	48	35.5
	8.05	6.89	1.16	45	38.8	8.0	6.70	1.35	47	34.8
	7.97	6.77	1.20	49	40.8					
	8.00	6.75	1.25	50	40.0					
	7.85	6.70	1.15	46	40.0					
	9.97	6.75	1.22	45	36.9					

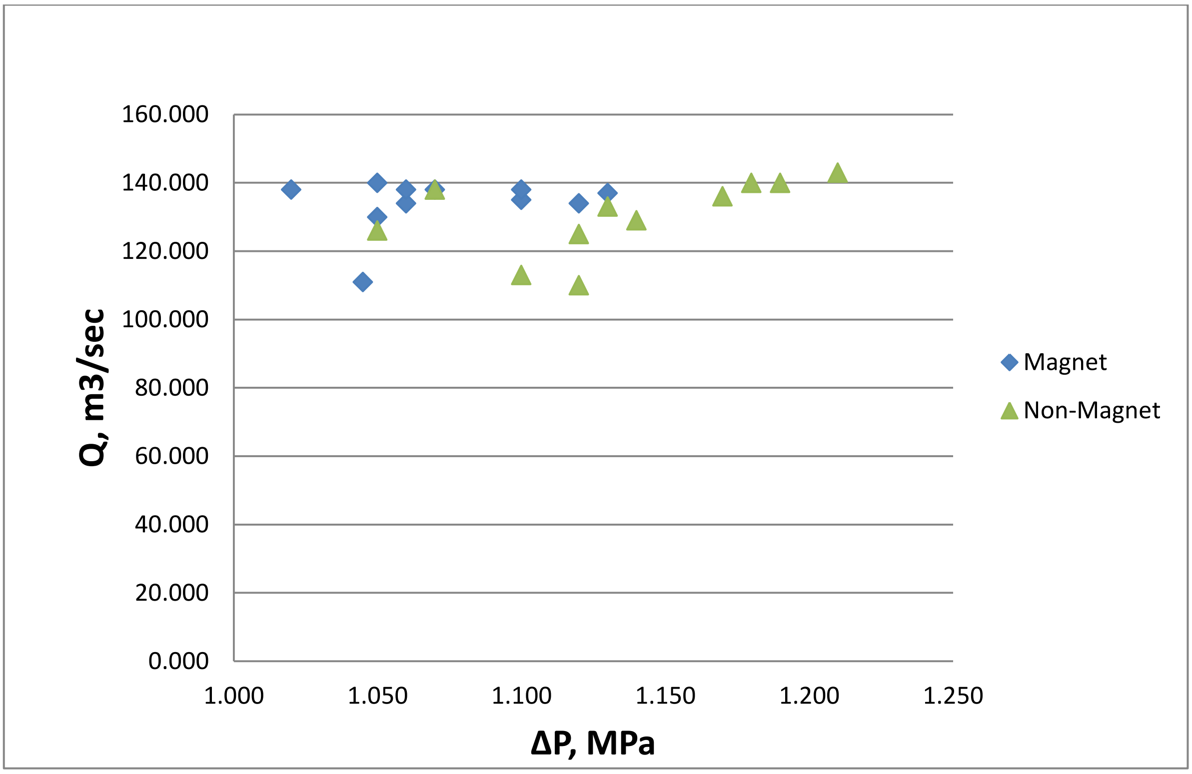

Figure 12. Dependence of the fluid yield on decrease of pressure in the crossbeam of the well № 252 of Surakhany OGEO

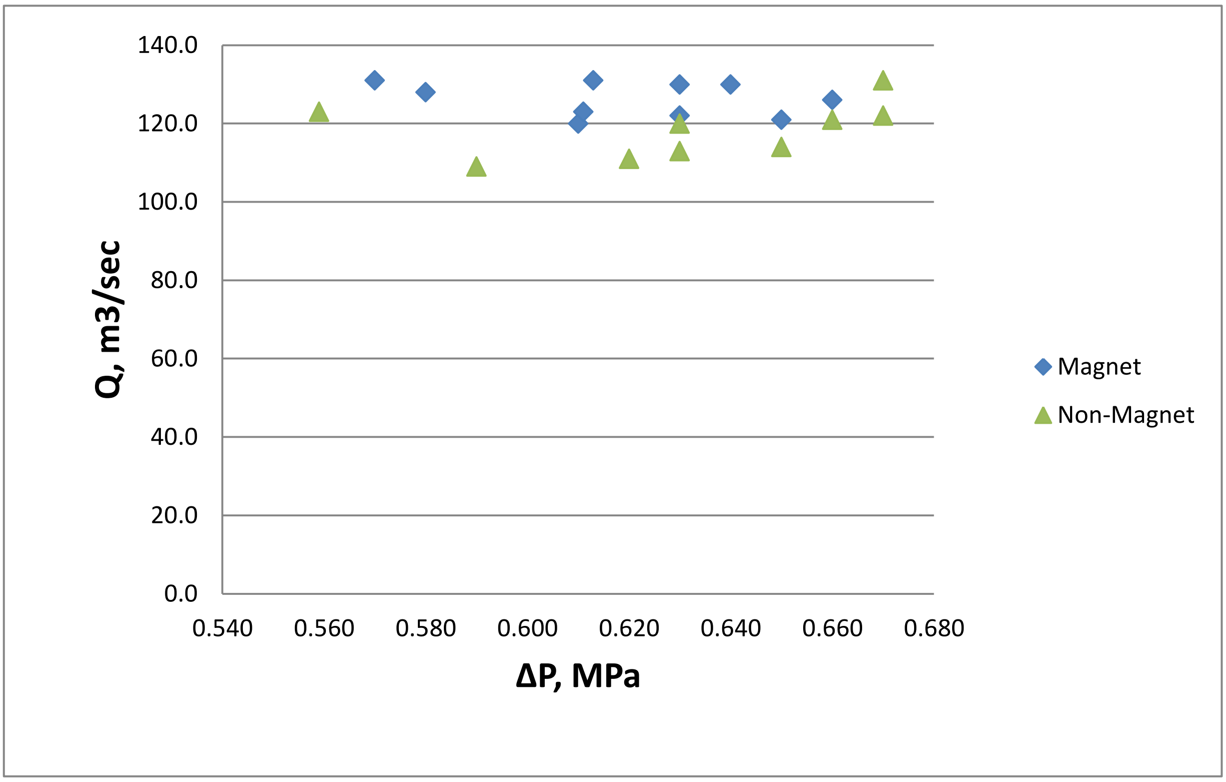

Figure 13. Dependence of the fluid yield on decrease of pressure in the crossbeam of the well № 253 of Surakhany OGEO

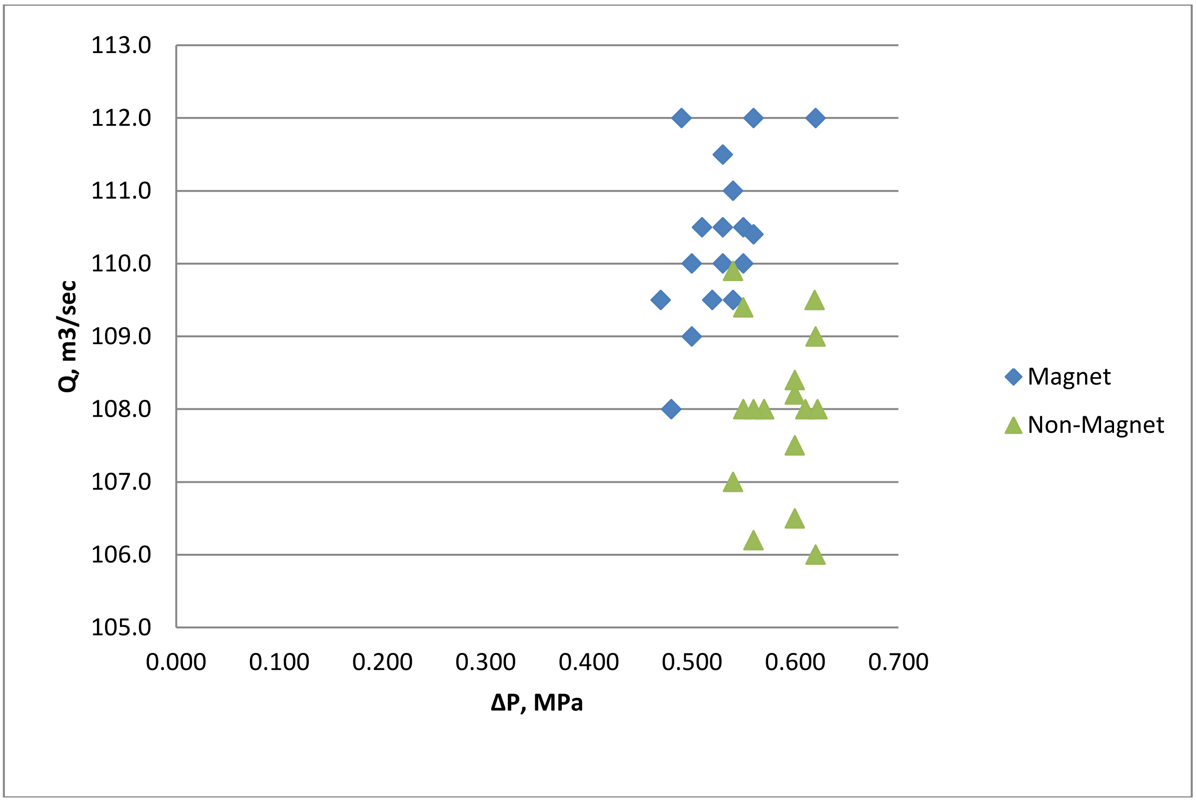

Figure 14. Dependence of the fluid yield on decrease of pressure in the crossbeam of the well № 1413 of Surakhany OGEO

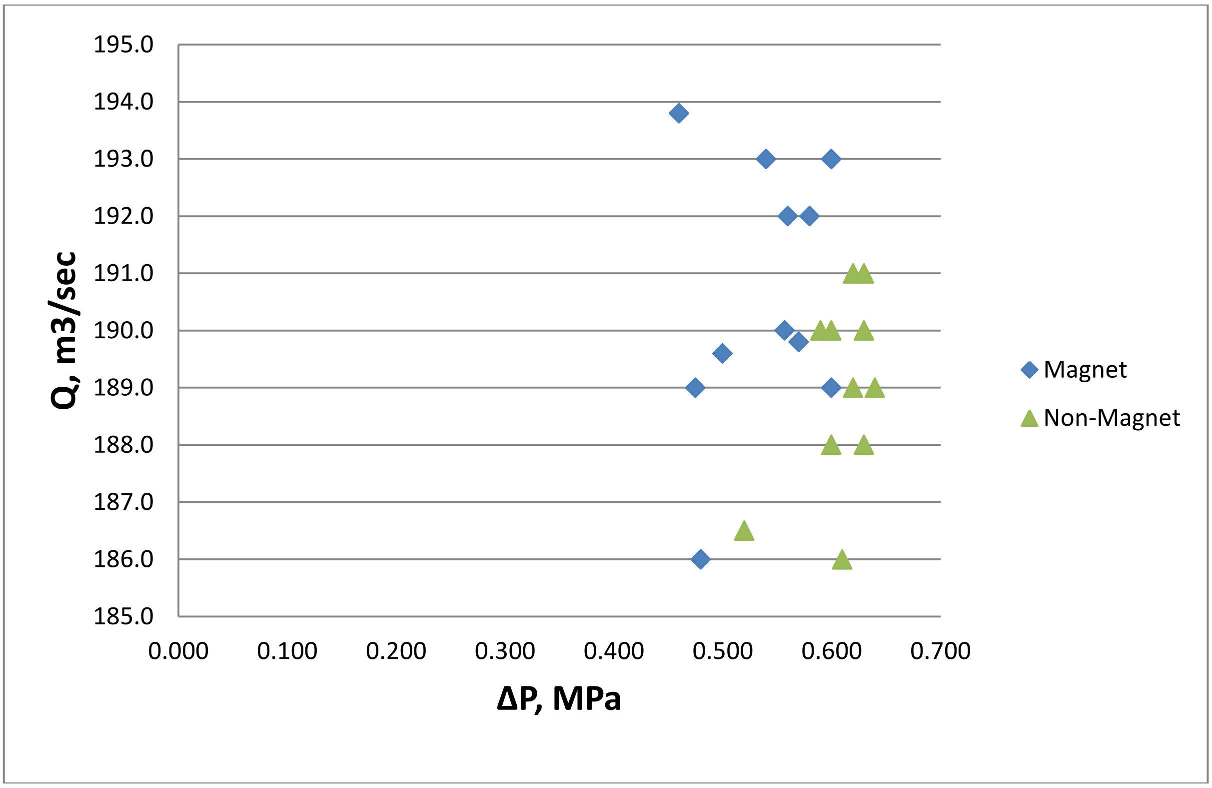

Figure 15. Dependence of the fluid yield on decrease of pressure in the crossbeam of the well № 1568 of Surakhany OGEO

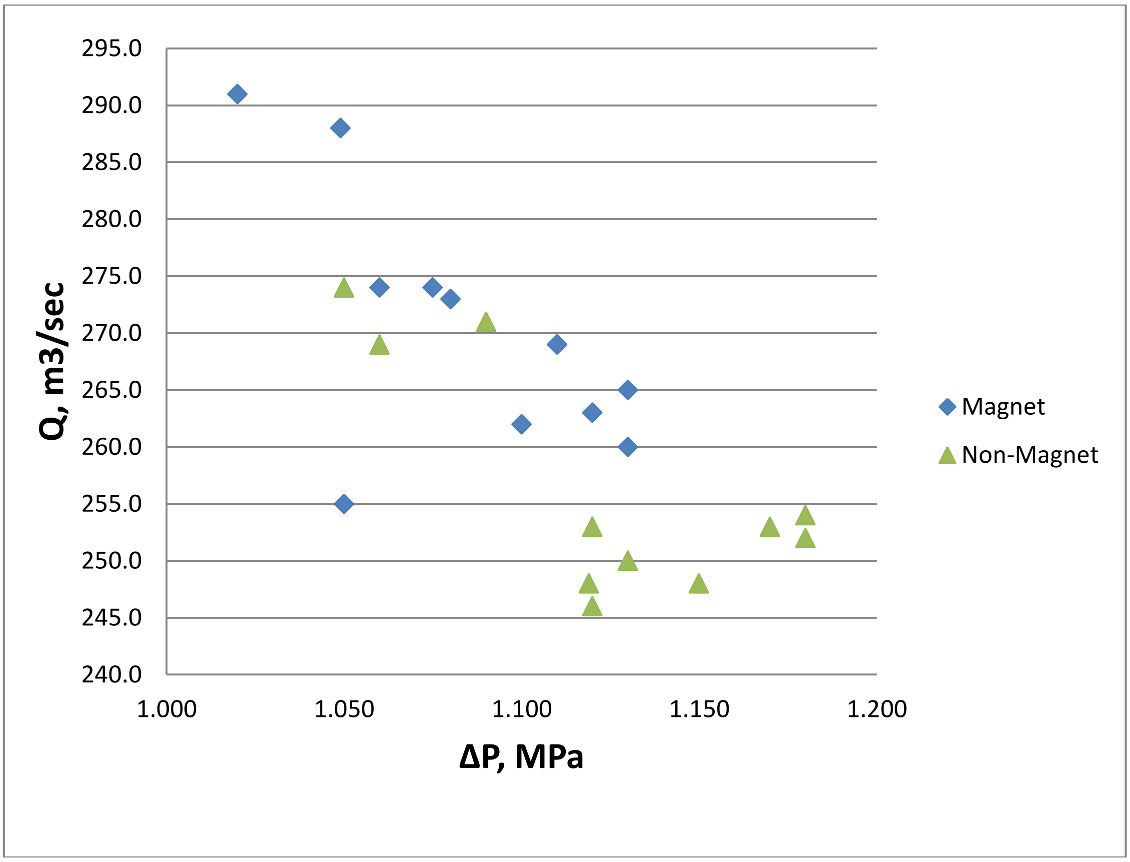

Figure 16. Dependence on decrease of pressure in the crossbeam of the well № 252 of Surakhany OGEO

Analysis of graphic materials gives possibility to conclude on significant change of the ability of conductivity of crossbeams for every concrete case. The result of the investigations for estimation of the degree of change in the ability of conductivity after magnetic processing is given in coordinates $Q_w/\Delta P$-ΔP. [4]

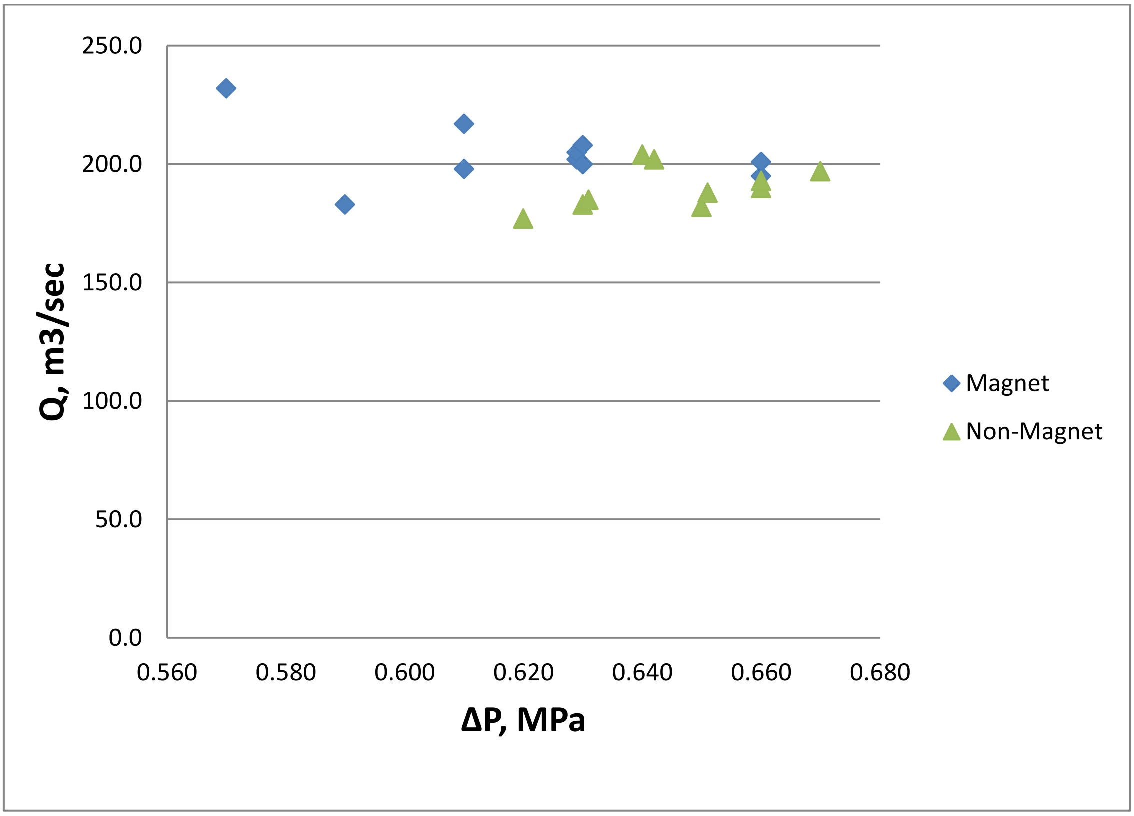

Figure 17. Dependence of the well № 253 of Surakhany OGEO on decrease of pressure of the ability of conductivity in the crossbeam

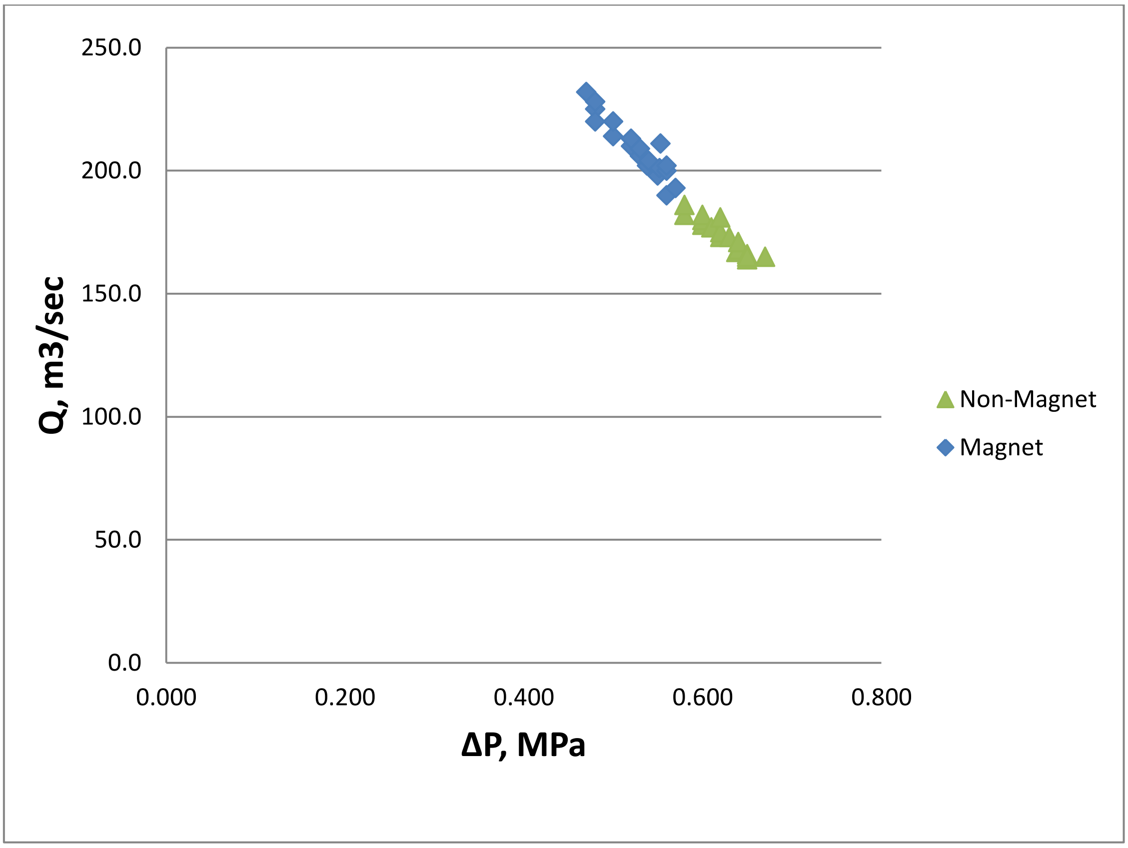

Figure 18. Dependence of the well №1413 of Surakhany OGEO on decrease of pressure of the ability of conductivity in the crossbeam

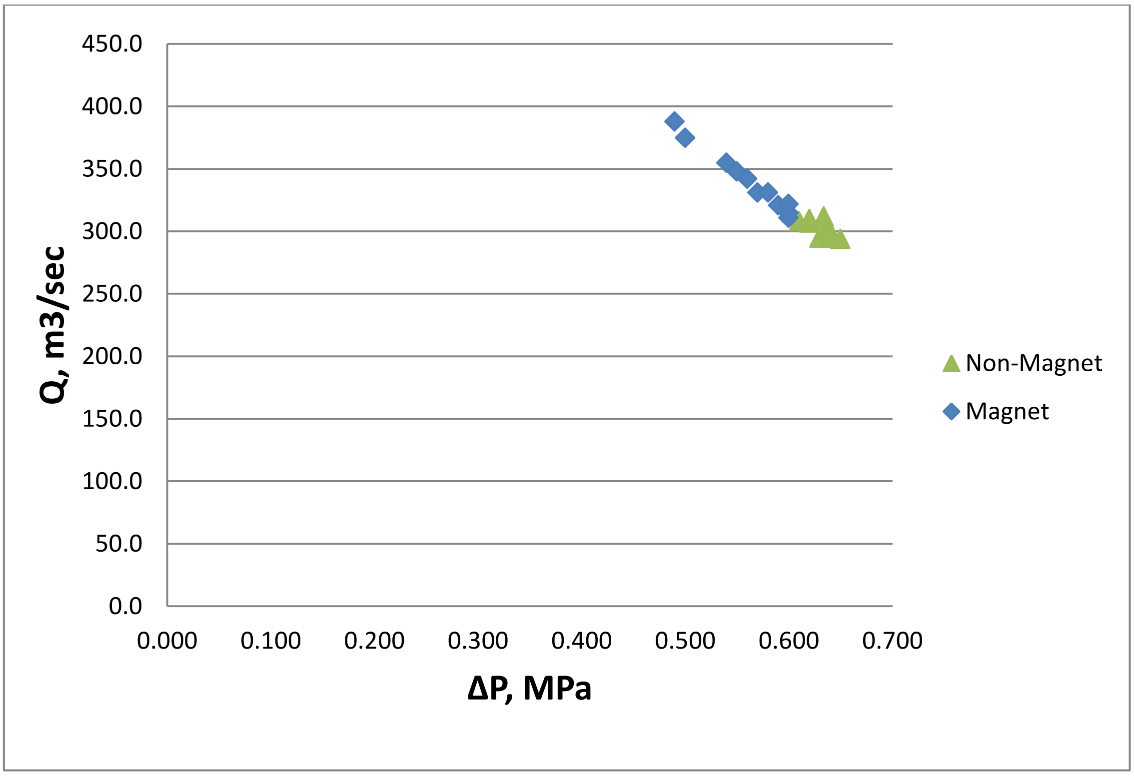

Figure 19. Dependence of the well № 252 of Surakhany OGEO on decrease of pressure of the ability of conductivity in the crossbeam

Exact information is given on causing of increase of the ability of conductivity of the crossbeam of the magnetic impact for 10-23%. The result of the analysis of testing-industrial analysis was given in the table.

Table 6. Result of the field investigations upon appointment of the ability of conductivity of crossbeams of the wells of Surakhany OGEO, N.Narimanov OGEO and Gum Adasy

Wells' №	Exploitation Method	With Magnetic Effect			With Magnetic Effect			Increase
		ΔP, 10^{-1} MPa	Qw, 11,57 10^{-6} m^3/sec	Q_w/ΔP, 11,57 x10^{-6} m^3/sec	ΔP, 10^{-1} MPa	Qw, 11,57 10^{-6} m^3/sec	Q_w/ΔP, 11,57 x10^{-6} m^3/sec	Qw/ΔP, %
252	EMN	1,04	293,8	282,5	1,17	289,0	247,0	14,3
75252	EMN	0,91	274,5	301,6	1,07	258,3	241,4	24,9
253	EMN	0,63	128,2	203,6	0,68	121,1	178,0	14,3
75253	EMN	1,06	209,7	198,1	1,14	203,1	177,7	11,5
1413	EMN	0,53	110,1	206,5	0,63	107,9	171,3	20,5
1568	EMN	0,54	190,6	355,0	0,63	189,4	303,5	16,9
1378	EMN	0,59	127,6	216,3	0,66	125,7	189,7	14,0
459	EMN	0,41	75,1	181,4	0,50	71,2	142,2	22,5
796	EMN	0,97	233,8	241,0	1,18	232,5	191,1	22,3
43	Gas-lift	0,41	77,4	188,7	0,50	76,1	152,7	23,5
369	Gas-lift	4,64	63,1	13,5	5,61	57,1	10,2	32,3
348	Gas-lift	2,91	107,7	38,3	3,17	104,7	32,8	17,7
371	Gas-lift	1,13	46,8	42,1	1,44	45,9	31,9	29,8
1002	Gas-lift	9,31	79,2	8,5	9,56	73,4	7,7	10,3

It is necessary to state that for regulation of the ability of conductivity of crossbeams:

- Watered oil (upon Surakhany OGEO);
- Emulsion oil (well № 43 of Sangachal sea field, upon the wells № 369, 348, 371 of Gumdeniz field)

The possibility of utilization of the magnetic field in the wells was considered.

The work was supplied by electric depth pumps and was implemented in the well development in gas-lift method. The results of the investigations are given in the schedule and figure. [9]

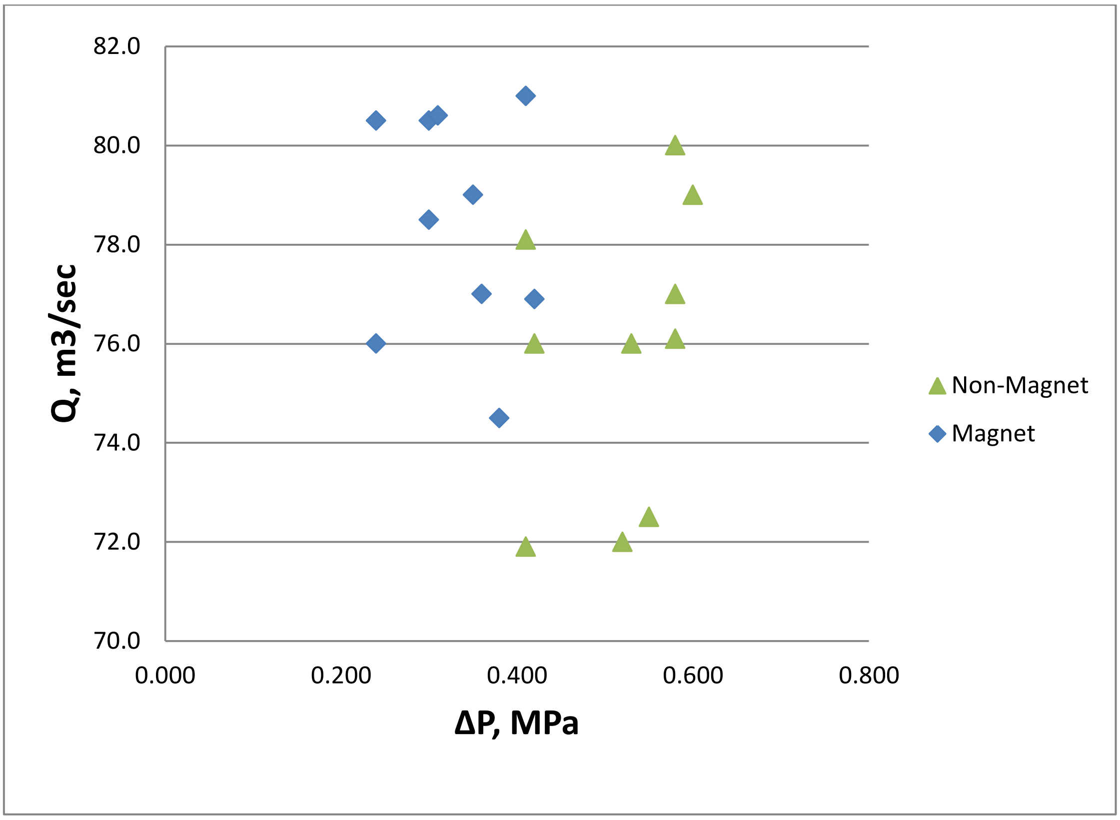

Figure 20. Dependence of the fluid yield on decrease of pressure in the crossbeam of the well № 43 of named after N. Narimanov OGEO

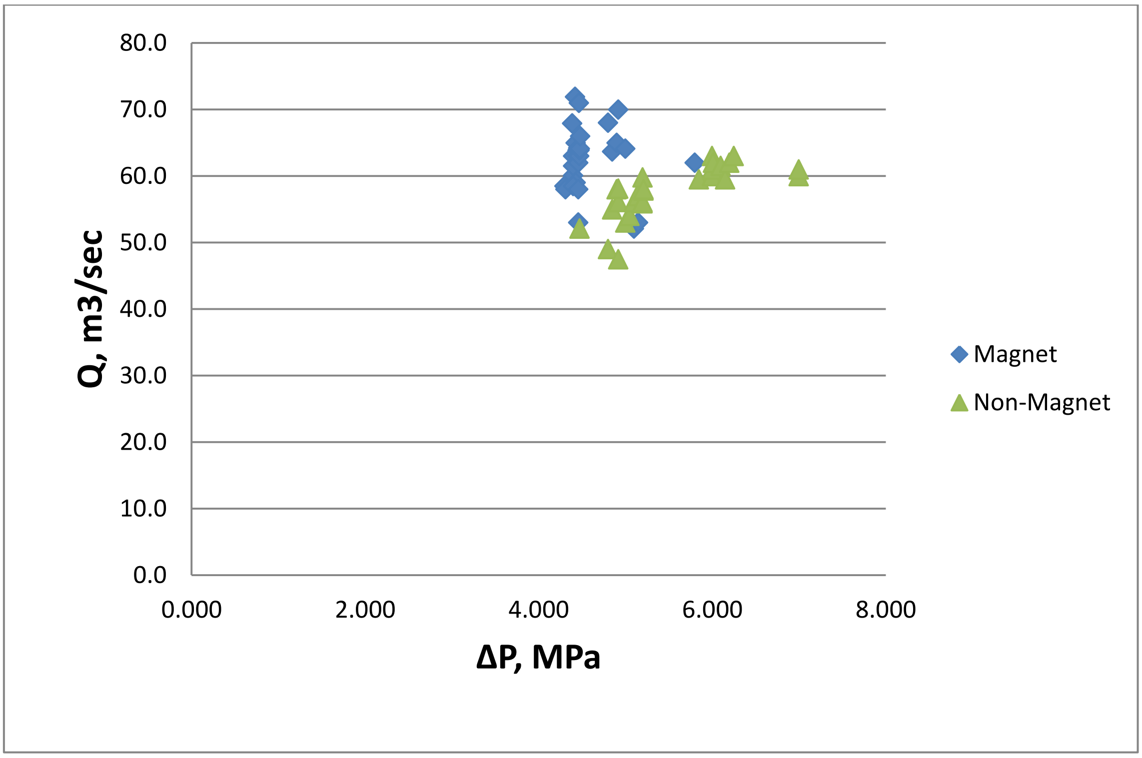

Figure 21. Dependence of the fluid yield on decrease of pressure in the crossbeam of the well № 369 of named after N. Narimanov OGEO

According to the information in the schedule, average increase of the ability of conductivity upon the wells was 17-32% and at this time the least increase (10.3%) was observed in the well № 1002 producing waterless oil. [6]

As well as, it is necessary to state the fact of strong impact of the magnetic field on the ability of conductivity (increase of the ability of conductivity is 17-32%) while presenting the product of the well with durable emulsion. Stated fact agrees well with the results of the investigations upon regulation of the magnetic field of oil-water emulsion.

CHAPTER 4. CALCULATION OF GAS-LIFT LIFTER

Principal condition of rational utilization of the possibility of production of gas-lift lifter is correct determination of the construction of the lifter and its working regime. Additional energy is given from the surface for elimination of fluid in exploitation via gas-lift method. It is necessary to try to contribute to enough or maximum extraction of fluid for a concrete well in selection of the working regime of gas-lift lifter. The gas-lift lifter will meet the following requirements [10]:

- Spending of energy will be the least during extraction of fluid from the well.

The following information will be available upon each well for complete implementation of the lifter:

1. Value of the reservoir pressure and fertility coefficient of the reservoir
2. Allowed depression or deemed allowed yield
3. Depth of the well and diameter of the protective belt
4. Special weight of the extracted fluid
5. Gas factor and coefficient of solution gas in oil (adopted as 0.5)
6. Pressure in gas distribution system

The working pressure of given gas (P_w), its spending (V), depth of introduction of gas (L), i.e. length and diameter (d) of lifting pipes will be coordinated with each other in designing of exploitation of gas. The yield of the well (Q) and the pressure of the bottom of the well (P_b) is determined from the condition of collection of oil-gas. The working parameters of fountain and gas-lift wells are fixed by means of the equation suggested by the Russian academician A. P. Krilov for the experimental purposes. Having developed analytically the results of the investigated practice A. P. Krilov suggested the report formulae for zero, optimum and maximum regimes. [4]

Having calculated the compressor lifter for the well developed by a limited fluid yield according to A. P. Krilov (determining its diameter, length and required gas):

Depth of the well h=1320 m; internal diameter of the exploitation well d=0.15 m; reservoir pressure P_{res}=5 MPa; productivity rate $K = 80 \frac{t}{day.MPa}$; maximum allowable pressure drop Δp=1.2 MPa; oil density ρ_o=900 kg/m^3; average density of oil and gas mixture between bottom and annulus of the well ρ_{mix}=871 kg/m^3; gas factor G_0=30 m^3/t; solubility rate of gas in oil $\alpha = 5 \frac{1}{MPa}$; used absolute working pressure P_{work}=2.85 MPa; absolute pressure in the annulus of the well P_a=0.12 MPa. Flow of oil to the well happens by linear law. There is no sand or water.

Allowable production of oil (initial production of well):

$$Q_i=K\cdot\Delta P=80\cdot10^{-6}\cdot1,2\cdot10^{6}=96 \text{ t/day}$$

Bottom pressure of the well:

$$P_b = P_{res}-\Delta P =(5-1,2)x10^{6}=3,8\cdot10^{6} \text{ MPa.}$$

As the bottom pressure of the well is more than the working regime and there is no sand in the well, the length of the lifter fill not be found by the depth of the well, but by the following formula for the working pressure [1]:

$$L=H - \frac{P_b-P_{lift}}{\rho_{mix}\cdot g}$$

Herein P_{lift} – is the pressure of the lifter in the shoe of the pipes, Pa.

Considering the attack loss as 0.4 MPa (according to the data given by the practice) during the movement of gas from the compressor to the shoe of pipes, we can get the followings:

$$P_{lift} = P_{work}- 4 =(6.45-4)\cdot10^{6} = 2.45 \text{ Pa}$$

Length of the lifter

$$L = 1320 - \frac{(3.8-2.45)\cdot10^{6}}{871\cdot9.81} = 1163\, m$$

Diameter of the lifter during the work in Q_{opt} regime:

$$d_{opt} = 188\sqrt{\frac{L\rho_H}{p_{lift} - p_i}}\sqrt[3]{\frac{QgL}{L\rho_H g - (p_{lift} - p_i)}} =$$

$$= 188\sqrt{\frac{1163 \cdot 900}{(2{,}45 - 0{,}12).10^6}}\sqrt[3]{\frac{96 \cdot 9{,}81.1163}{1163 \cdot 900 - (2{,}45 - 0{,}12).10^6}} = 65\,\text{mm}$$

We accept standard pipes having internal diameter of d=62 cm.

Optimal total special spending of gas (including gas extracted from the well or available in the well) is obtained by the following formula [5]:

$$R_t = \frac{9.10^{-3}L(1-\xi)}{d^{0,5}\xi\lg\frac{p_{lift}}{p_i}} = \frac{9.10^{-3}.1163(1-0{,}227)}{6{,}2^{0,5} \cdot 0{,}227\lg\frac{2{,}45.10^6}{0{,}12.10^6}} = 146\,m^3/t$$

Relative sinking of the lifting pipes:

$$\xi = \frac{P_{lift} - P_i}{Lg\rho_H} = \frac{(2{,}45 - 0{,}12)}{1163 \cdot 9{,}81.900}.10^6 = 0{,}227$$

Taking into account solution gas, special expenditure of given gas [11]:

$$R_0 = R_t - (G_0 - \alpha\frac{P_{lift} + P_i}{2} = 146 - \left(30 - 5 \cdot 10^{-6}\frac{(2.45 + 0.12) \cdot 10^{-6}}{2}\right)$$
$$= 123m^3/t$$

Daily expenditure of gas:

$$R_0Q_i=123 \cdot 96 = 11800\ m^3/day$$

CONCLUSIONS

The followings were known from the investigations implemented by some investigators in the thesis work:

- the exploited wells' productivity increases while exerting influence on those wells by the magnetic field;
- the best impact effect is in maximum value of amplitude and minimum value of frequency while exerting influence on oil with paraffin by the magnetic field;

- increase of the impact effect as the period of storage in the magnetic area rich with paraffin increases.

According to the stated information, application of new physical and chemical methods – changeable and stable magnetic field in struggle against paraffin has great importance.

The result of the thesis can be applied to all fields. Magnetic method is one of EOR methods. According to the obtained results from the Surakhany field, we can say that Magnetic method considerably increases wells' productivity. This method, especially, is effective in the fields, where the productivity rate is very low.

Besides Surakhany field, Magnetic method has been applied in Azerbaijan's some other fields, including Neft Dashlary. The method has also been used outside of Azerbaijan as well as Tatarstan, Vietnam, the Bashkir Republic's fields by our scientists. Similar results have been got in those fields as in Surakhany. Even in some fields, the productivity rate has been 0.98.

All these information allows us to say magnetic method can be applied to all fields and will give great results.

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