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On The Impact Of Water Flooding On The Coefficients Of Washing And Oil Recovery From Productive Formations Of The Fergana Oil And Gas Region, Represented By Carbonate Reservoirs

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ABSTRACT

Based on the generalization of the experience in the development of multilayer fields in the Fergana oil and gas region, the influence of the use of water flooding at a late stage on the coefficients of washing and oil recovery from productive formations was studied. By using statistical methods of data processing, the dependences of the oil recovery factor on the reservoir flushing coefficient and the reservoir flushing coefficient on the compensation of fluid withdrawal by water injection were obtained, with sufficiently high correlation coefficients. The obtained dependencies confirm the theoretical foundations of oil recovery from productive formations developed with the use of water flooding and can be used in the design of the process at similar facilities.

KEYWORDS

Field, reservoir, development, water flooding, flushing, recovery, compensation, withdrawal, injection, dependence, coefficient, correlation, treatment, process, increment.

INTRODUCTION

In many "old" oil-producing regions of the world, including the Fergana oil and gas region (FOGR) of the Republic of Uzbekistan, there is a tendency for the quality state of the resource base to deteriorate and incomplete replenishment of oil production with an increase in their reserves due to the discovery of new fields. At the same time, the costs of prospecting and exploration are growing, the geological and physical conditions and specific reserves attributable to each discovered field are deteriorating. Due to their small size, they are prepared for industrial development with a limited number of exploration wells. Naturally, there are problems associated with the lack of initial geological and field data for reliable calculation of reserves and solving the issues of a rational and profitable development of these fields. Some of which are currently being developed by single exploration wells and some are mothballed and are awaiting commercial development.

The study aims to establish generalized regularities of the oil recovery factor from the degree of reservoir flushing, to adopt development strategies for new, small in terms of oil reserves, the productive formations of which are represented by carbonate reservoirs.

MATERIALS AND METHODS

The geological structure of the FOGR deposits and the features of their development are considered in many works. A detailed description of the parameters of the geological and physical conditions and the implemented development systems are given in the works [1-7].

However, we considered it necessary to give a brief description of the geological and physical conditions and the implemented systems for the development of fields in the FOGR, which is as follows. The structure of the Fergana region includes Neogene, Paleogene, Mesozoic (Cretaceous, Jurassic) and Paleozoic deposits. The total thickness of the sedimentary cover in the central parts of the depression is more than (10.0-12.0)*103 m, in the near-bank - (2.5-4.0)*103 m and more [4-9].

A characteristic feature of the distribution of hydrocarbon deposits is a significant increase in gas content down the section. If the sediments of the Neogene and Paleogene are mainly oil-bearing, and the accumulations of free gas are associated with gas caps and single gas deposits, then in the Cretaceous and Jurassic deposits mainly gas and gas condensate deposits are developed [5].

In the Paleogene section, up to eight productive strata are distinguished, of which strata V, VI, VII, VIII, IX are represented by carbonate rocks (limestones and dolomites) [6-11]].

Oils of Paleogene sediments are mainly light (826-884 kg/m3), low-sulfur (0.05-0.75%), paraffinic (1.4-10.1%), highly resinous (silica gel resins 5.29-30.2). The viscosity of reservoir oils is low - 0.7-0.6 mPa*s, the initial gas saturation is from 2-5 to 100-150 m^3/t. Oil deposits are confined to narrow asymmetric folds, the length of which is (10-15) * 103 m, the width does not exceed (2-3) * 103 m, the dip angles of the layers are 20-300 and more. Known oil and gas deposits are mainly of the formation-vaulted type. However, as a result of intense tectonic activity in terms of the degree of complication by disturbances, tectonically screened deposits are also observed among them (Palvantash, Andijan, Khodzhaabad and other deposits). Shielded lithological deposits in the region are sparsely distributed. Productive deposits of the objects under consideration are heterogeneous, they are characterized by layered, zonal heterogeneity and uneven fracturing. Almost all deposits are multilayer. The largest number of deposits has been discovered in the section of the Severo-Sokhskoye, Yuzhno-Alamyshikskoye, Andijan and Palvantashskoye fields. Oil deposits are characterized by insignificant height, the small difference between the initial reservoir pressure and the pressure of oil saturation with gas. During the development of the studied oil deposits, regardless of the type of reservoirs, due to their shallow depth, comparable sizes (oil reserves), almost the same development systems were implemented. The following features of the implemented systems are highlighted [12-17]:

- Drilling of deposits with a relatively dense grid of wells, placed in a triangular pattern;
- Joint exploitation of deposits of horizons V + VI, VII and VIII of some fields;
- Development of deposits in the initial period in a natural mode, followed by the use of various water flooding systems (deposits with relatively small reserves are developed without maintaining reservoir pressure).

Due to the close values of the initial reservoir pressure of oil deposits and the saturation pressure of oil with gas, as well as the late application of water flooding, the low activity of circuit waters, which most often did not significantly affect the development process, the overwhelming part of the oil deposits were drained at the initial stage of development in the dissolved gas.

At present, all the objects under consideration are at the fourth stage of development, which is characterized by low rates of oil production - less than 2.0% of the initial recoverable reserves, high water cut of the produced products and a significant drop in reservoir pressure, despite the implementation of measures to maintain it, and relatively low values of the oil recovery factor (ORF). The achieved oil recovery factors due to the objects being at the final stage of development (in some of them, development has already been suspended due to the complete watering of the produced wells) are also close to their final values. Therefore, the achieved oil recovery rates are considered by us as a result of the effectiveness of the implemented development system, in particular, the effectiveness of the water flooding method.

METHODS

With the introduction of a new generation of software for multidimensional computer modelling in recent years, qualitative development of methods for the geological and hydrodynamic study of oil fields has taken place.

As the experience of using these software tools shows, the results obtained are determined by the completeness and quality of the initial geological field information.

The solution of the problems of geology and development based on the use of literature and reference data or objects of analogues in the construction of geological and hydrodynamic models of oil fields can lead to distortion and decrease in the reliability of the data obtained.

In this regard, if the necessary high-quality initial geological and field information is insufficient, the use of models based on integral indicators and obtained by summarizing the experience of long-term exploited deposits [16, 17] for solving various problems of oil field development is also relevant in the current level of knowledge of the theory and practice of developing oil fields.

Based on the above arguments, we used the least-squares method, which is the basic method of regression analysis, to solve this goal.

We would like to conclude the rationale for the choice of the research method with the words of the scientist-geologist I.M. Gubkin "The weakness of scientific work lies in the insufficient comprehension of the accumulated rich experience."

THEORY

The coefficient of oil recovery from productive formations depends on many geological, technological and economic factors. At the same time, in the opinion of many scientists, the reservoir operation mode is decisive [18-24].

The greatest value of the oil recovery factor is achieved under conditions of manifestation of a water-driven operation of oil deposits, that is when oil is displaced by water. This is largely due to the energy resources of edge or bottom waters, which can sometimes be unlimited in comparison with the energy reserves of free gas compressed in a gas cap (gas cap mode) and dissolved in oil (dissolved gas mode). Also, relatively higher efficiency of flushing oil-saturated pores with water is noted, since the ratio of the viscosity of oil and water is more favourable when oil is displaced by water than by gas.

Due to these positive factors, waterflooding of productive formations to increase oil recovery factor is widely used in the practice of developing oil fields. According to scientists, the artificial flooding method is currently used in more than 90% of developed fields [25-29].

Based on the results of theoretical studies, it was predicted that oil recovery under a water-driven regime and its artificial analogue - waterflooding - should be at least 50%, and under favourable geological and physical conditions, it should reach up to 80%. However, the results of the development of many oil fields in the world using water flooding do not confirm the expected results. So, development with a continuous displacement of oil by water, according to the research of prof. V.N. Shchelkacheva provides an average of 41% oil recovery, and according to Academician. A.T. Gorbunov - 38% [30-34].

In this regard, considerable attention has been and is being paid to the study of the features of artificial flooding of deposits in various geological and physical conditions and to finding ways to improve it. Such studies, as is known, on the one hand, make it possible to use the accumulated experience of reservoir exploitation during artificial waterflooding in the process of designing the development of new fields: on the other hand, they contribute to the effective additional development of depleted objects, in which huge material and technical resources have already been invested. This is evidenced by numerous works

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devoted to various issues of the development of oil fields in Bashkortostan, Tatarstan, Kuibyshev, Orenburg and Perm regions, Ukraine and Azerbaijan using waterflooding.

To assess the effectiveness of the implemented development systems, many researchers recommend using the dependence of the oil recovery factor on the degree of formation washing [35-37].

At the same time, the achievable oil recovery factor is taken as a criterion for assessing the technological efficiency of the development systems implemented at the field, with the same degree of flushing of the volume of pores occupied by oil

$$ORF = f\left(\tau\right) \qquad (1)$$

Where $\tau = \frac{\sum Q_{ж}}{IGOR}$ - flushing rate, $\sum Q_{ж}$ – accumulated fluid extraction under reservoir conditions; IGOR – initial geological oil reserves.

In contrast to the numerous forms and types of displacement characteristics that have long been used in practice, this technique is convenient because it allows you to use primary, and therefore to a lesser extent distorted, initial data, such as fluid selection, which is taken into account fairly reliably in field conditions, geological oil reserves at the late and final stages of development, conversion coefficients of physical parameters of fluids in reservoir conditions, etc. The multiplicity of reservoir washing, being a relative value, is convenient for comparison, since it is equally applicable in the analysis of both small deposits and large deposits [38-40]. Based on the use of the dependence τ on ORF, we estimate the effect of flooding on the degree of recovery of geological oil reserves and the value of the reservoir flushing coefficient.

CALCULATION

Earlier, in [8], for the oil deposits of the FOGR, represented by carbonate reservoirs, a straight-line dependence of the oil recovery factor on τ was proposed:

- for all development objects

$$ORF = 0{,}1405 + 0{,}1661 * \tau \qquad (2)$$

$r = 0{,}7765;$

- for objects developed in natural modes

$$ORF = 0{,}0105 + 0{,}2211 * \tau \qquad (3)$$

$r = 0{,}8284.$

- for facilities developed using waterflooding

$$ORF = 0{,}0733 + 0{,}2 * \tau \qquad (4)$$

$r = 0{,}7784.$

Analysis of these dependencies shows that they do not have a clear physical meaning, since The recovery factor cannot be more than 1 (at τ> 5.2), and its growth is the same for all growth intervals of τ. The mechanism of oil recovery from productive formations involves a decrease in oil saturation during development, therefore, at each subsequent interval of increase in τ, the corresponding increase in oil recovery factor should decrease, and after reaching a certain limit, the injected

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water practically does not participate in the displacement of residual oil. To describe these processes, we re-processed the initial data given in [8] and obtained the following exponential dependences of the recovery factor on τ (Fig. 1 - 3):

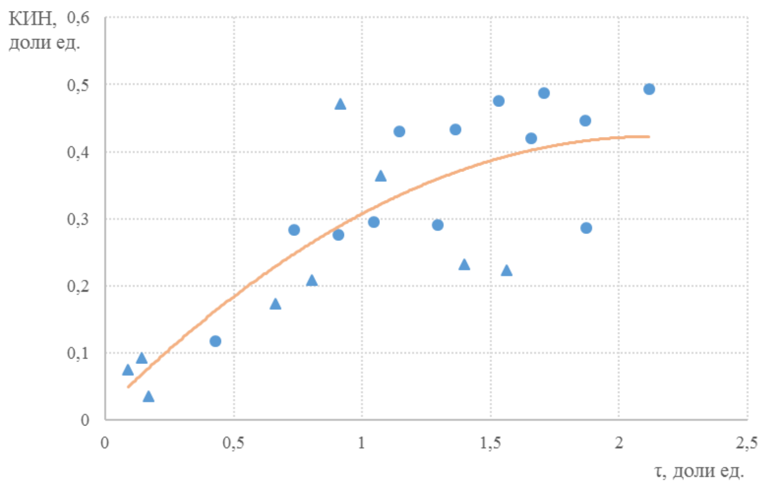

Fig. 1. Dependence of the oil recovery factor on the reservoir flushing factor for all objects of the FOGR, represented by carbonate reservoirs:

- objects developed using waterflooding;

- objects developed without the use of waterflooding.

- for all 23 development objects (r = 0.808);

$$ORF = 0,4775*\left(1-e^{-1,073*\tau}\right) \quad (5)$$

- for 13 objects developed with flooding (r = 0.813);

$$ORF = 0,6259*e^{-0,6561/\tau} \quad (6)$$

- for 9 objects developed without flooding (r = 0.793);

$$ORF = 0,3441*\left(1-e^{-1,9272*\tau}\right) \quad (7)$$

The obtained dependences (5) - (7) are distinguished by higher values of the correlation coefficients (τ) than those proposed in [8] and provide answers to the disadvantages noted above. For example, after reaching the flushing rate τ more than 1.5, the growth rate of the oil recovery factor decreases. In this case, the values of τ equal to 0.5; 1.0; 1.5; and 2.0 correspond to the oil recovery factor at the facilities developed with the use of water flooding - 0.186; 0.298; 0.411 and 0.524, and at facilities developed without water flooding - 0.121; 0.232; 0.346 and 0.453. The obtained dependencies (5) - (7) make it possible to compare the efficiency of development of objects with and without the use of waterflooding on deposits with similar geological and physical conditions and development systems.

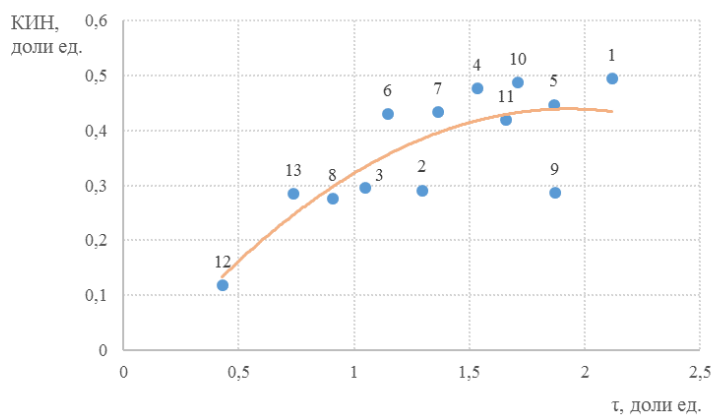

Fig. 2. Dependence of the oil recovery factor on the reservoir flushing factor for the FOGR objects, represented by carbonate reservoirs and developed using water flooding:

1 - Andijan deposit, horizons V + VI;

2 - Andijan deposit, horizons VII + VIII;

3 - Khodjaabad deposit, horizon VII;

4 - Khodjaabad field, VIII horizon;

5 - Palvantash deposit, V + VI horizons;

6 - Palvantash deposit, horizons VII + VIII;

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7 - Western Palvantash deposit, horizon VII;

8 - Western Palvantash deposit, horizons VIII + IX;

9 - Severny Sokh deposit, horizon VIII;

10 - Khankyz deposit, horizon VII;

11 - Avval deposit, horizons V + VI;

12 - Khodjaabad field, V + VI horizons;

13 - Western Palvantash deposit, V + VI horizons.

We also considered the effect of flooding on the frequency of reservoir flushing. As a result of processing the indicators of the development of objects, an exponential dependence of the following form is obtained (τ = 0.798):

$$\tau = 1,704\left(1 - e^{-0,021*K}\right) \quad (8)$$

Where K – compensation of liquid extraction by water injection.

The compensation of the liquid intake by the injected water is calculated according to the formula [15]:

$$K = \frac{V_{зак}}{V_н * в + V_в} * 100\ \% \quad (9)$$

Where K – current compensation, %;

$V_{зак}$ – the volume of injected water, $м^3$;

$V_н$ – the volume of oil produced, $м^3$;

в – the volume coefficient of oil, fractions of units.;

V_w – the volume of extracted water, $м^3$.

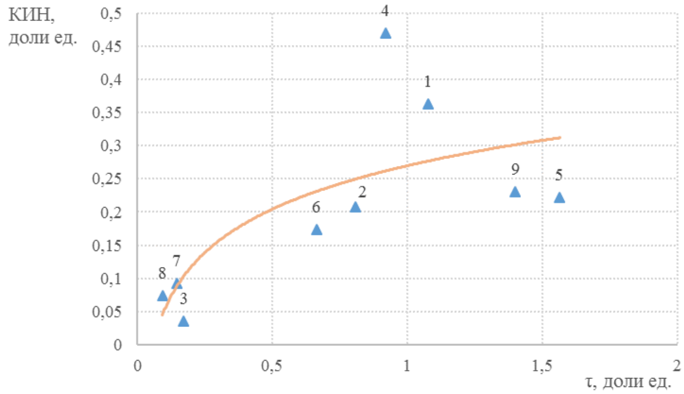


Fig. 3. Dependence of the oil recovery factor on the reservoir flushing factor for the FOGR facilities, represented by carbonate reservoirs and developed without waterflooding:

1 - Khartum field, VI horizon;

2 - East Khartoum deposit, VI horizon;

3 - Khankyz deposit, V horizon;

4 - East Avval field, horizons V + VI;

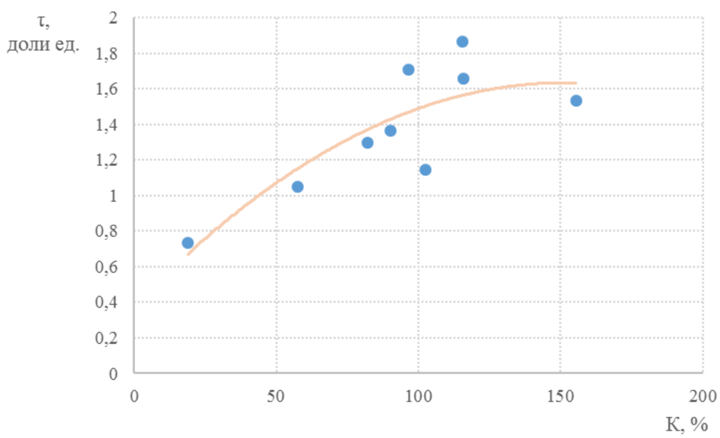
5 - Chimion deposit, V horizon;

6 - Varyk deposit, horizon VII;

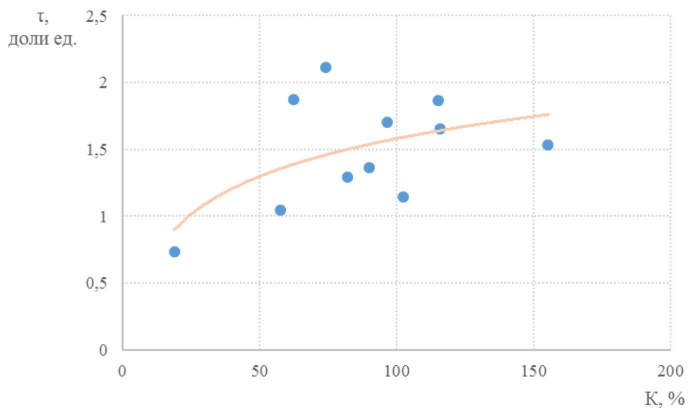
7 - Varyk deposit, horizon IX;

8 - Tergachi field, V horizon;

9 - Namangan deposit, V horizon.



a)



b)

Fig. 4. Dependence of the frequency of formation flushing on the compensation of fluid withdrawal by water injection:

a) - for facilities with compensation for fluid withdrawal by water injection of less than 150%;

b) - for all objects.

Analysis of dependence (8) shows that after reaching 100% compensation for fluid withdrawal by the injected water, the rate of increase in the rate of flushing of the formation decreases (Fig. 4).

Therefore, during waterflooding with compensation for fluid withdrawal by water injection of more than 100%, geological and technological measures to optimize the volumes of injected water and their distribution among injection wells become especially relevant, which is noted by the results of numerous studies [12, 13, 14, 15, 16].

CONCLUSION

Based on the factual materials of long-term developed oil deposits of the FNGO, the effectiveness of waterflooding is shown at the later stages of their operation.

The obtained generalized dependences show a decrease in the increase in oil recovery factor as the rate of flushing of the formation increases by more than 1.5. After achieving compensation of liquid withdrawal by the injected water more than 100%, the efficiency

of oil displacement by water decreases, which implies work to optimize the volumes and distribution of the injected water through the injection wells. The results obtained confirm the theoretical foundations of the process of oil recovery from productive formations during waterflooding.

REFERENCES

1. PC. Khodzhaev, A.M. Akramkhodzhaev, P.K. Asimov at. al. (1973). Oil and gas fields of Uzbekistan. Tashkent: FAN, 1973. P.188.
2. Irmatov E.K., Agzamov A.Kh. (1992). Waterflooding of oil fields with complicated mining and geological conditions and ways to improve its efficiency. Tashkent: Publishing house of the Academy of Sciences of the Republic of Uzbekistan. P.60.
3. Irmatov E.K., Agzamov A.Kh. (1991). Experience and problems of improving the development of oil and oil and gas fields in Central Asia and methods of increasing their oil recovery. Tashkent: FAN. P.71.
4. Agzamov A.Kh. (1988). Comparative assessment of the efficiency of carbonate reservoir development systems on the example of the fields of the Fergana oil and gas region. Geology, geophysics and oil field development. Moscow .: VNIIOENG. No. 2. pp. 18-20.
5. Agzamov A.Kh. (1985). The influence of some physical and geological factors on the efficiency of waterflooding on the example of the South Alamyshik field. RNTS Ser. Oilfield business and oil transportation. - Moscow .: VNIIOENG. No. 12. pp. 8-10.
6. Posevich A.G., Agzamov A.Kh., Ermatov N.Kh. (1998). Assessment of the influence of some geological, physical and technological factors on the efficiency of waterflooding in Fergana fields. Uzbek Journal of Oil and Gas. Tashkent. No. 3. pp. 23-25.
7. Kazakov, K.V., Korepanova, V.S., Nikitin, V.T., & Nikiforov, V.P. (2020). Approaches and some results of generalization of experience in the development of oil fields in the Timan-Pechora province. Oilfield business, (1), 5-12.
8. Agzamov A.Kh., Ermatov N.Kh., Agzamov A.A., Mukhammadiev Kh.M. (2020). The degree of influence of the frequency of formation flushing on the oil recovery factor of the deposits of the Fergana oil and gas region, represented by carbonate reservoirs, Geology, geophysics and development of oil and gas fields. Moscow.
9. Surguchev, M.L. (1985). Secondary and tertiary methods of enhanced oil recovery.
10. Ivanova M.M. (1976). Dynamics of oil production from deposits. - Moscow: Nedra. 247 p.
11. B.T. Basniev, V.V. Isaichev, S.V. Kozhakin., at al. Regulation of the process of oil field development. Moscow: Nedra. 197 p.
12. Baziev V.F. (2007). On the selection of fluid in the development of oil fields with flooding. Oil industry. No. 9. pp. 116-121.
13. Vylomov D.D., Shtin N.A., Tsepelev V.P. (2020). optimization of the reservoir

pressure maintenance system by injecting produced water instead of freshwater. Oil Industry. Moscow. No. 7. P. 97-99.

14. Rodnonov S.P., Kosyakov V.P., Pyatkov A.A. (2015). Investigation of the influence of the injection rate on the dynamics of oil production from a fractured-porous medium using new displacement characteristics. Neftepromyslovoe delo. Moscow. No. 1. P. 16-20.

15. Medvedev K.Yu., Belonozhko A.I., Mikhalevich V.A. (2016). A method for calculating the compensation of withdrawals in "discharged" deposits on the example of the Izvestinskoye field. Equipment and technologies for the oil and gas complex. Moscow. No. 6. P. 41-44.

16. Ankudinov A.A., Vaganov L.A. Methodology for distributing the volumes of injected water over the area of an oil field. Geology, geophysics and development of oil and gas fields. - Moscow, 2013. - No. 9. - P. 19-24.

17. Sadykov M.R., Sergienko V.N., Kutyrev E.F. Development problems with water flooding of low-permeable formations under saturated with oil. Oil industry. Moscow, 2006. No. 11. - S. 24-27.

18. A.Yu. Sentsov, I.V. Ryabov, A.A. Ankudinov et al. (2020). Analysis of the water flooding system using statistical methods of data processing. Oilfield business. Moscow, No. 8 (620). P. 5-9.

19. Akhmedov P.U, Ubayhodzhaeva Z.S. (2014). Development of sedimentation-volumetric models of productive horizons of Jurassic and pre-Jurassic deposits of new exploration areas and fields in the Bukhara-Khiva and Ustyurt regions. Tashkent: JSC "IGIRNIGM". 229 p.

20. Akhmedov P.U, Ubayhodzhaeva Z.S. (2012). Development of sedimentation-reservoir models of new prospecting areas and fields in order to increase the efficiency of geological exploration in the Bukhara-Khiva and Gissar regions. - Tashkent: JSC "IGIRNIGM". 277 p.

21. Irmatov E.K. Hydrochloric acid treatments - experience and problems. Uzbek Journal of Oil and Gas. Tashkent, 2016. No. 3. P. 47-50.

22. E.K.Irmatov, G.S.Abdullaev, A.Kh.Agzamov et al. (2017). Acid impact on rocks. Tashkent: Fan va technology. 316 p.

23. Patent of the Republic of Uzbekistan No. IAP 04106 dated 25.01.2008. Sh.Zh.Shamsiev, I.I.Diveev, A.S. Mustafaev and others. Method of development of oil and gas condensate fields.

24. Patent of the Republic of Uzbekistan No. IAP 04816 dated 20.07.2011. Sh.Zh. Shamsiev, I.I.Diveev, A.S. Mustafaev and others. Method of development of oil and gas condensate fields in conditions of formation of a water-oil emulsion.

25. G'ofurovich, H. O., Abdurashidovich, U. A., O'g'li, I. J. R., & Ravshanovich, S. F. (2020). Prospects for the industrial use of coal in the world and its process of reproducing. *PROSPECTS*, 6(5).

26. G'ofurovich, K. O., & Abdurashidovich, U. A. (2020). Justification of rational parameters of transhipment points from automobile conveyor to railway transport. *World Economics and Finance Bulletin*, *1*(1), 20-25.

27. G'afurovich, K. O., Abdurashidovich, U. A., & Ogli, B. A. O. (2020). Small Torch Progress In Prospects Gold Mining In Improving Countries. *The American Journal of Interdisciplinary Innovations and Research*, *2*(09), 65-72.

28. Akramov, B. S., & Khaitov, O. G. (2015). Oil displacement by water in an electric field. *Europaische Fachhochschule*, (11), 38-39.

29. G'afurovich, K. O. (2020). Modern State And Methods Of Enhancing The Productivity Of Field Progress In The South-Eastern Part Of Bukhara-Khiva Region. *The American Journal of Social Science and Education Innovations*, *2*(09), 423-432.

30. Khayitov, O. G. (2020). Evolution Of Petroleum Stratum Efficiency By-Multi-Factor Regression Analysis. *The American Journal of Engineering and Technology*, *2*(08), 79-84.

31. Akramov, B. S., & Khaitov, O. G. (2017). Oil displacement by water in an electric field. *Austrian Journal of Technical and Natural Sciences*, (3-4), 20-22.

32. G'afurovich, K. O. (2020). Current State And Ways To Improve The Efficiency Of Field Development In The South-Eastern Part Of The Bukhara-Khiva Region. *The American Journal of Applied sciences*, *2*(09), 194-206.

33. Khayitov, O. G., Nabieva, N. K., & Makhmudov Sh, N. (2013). Estimation of the degree of influence of the grid density of wells on the oil recovery coefficient of sub-gas oil deposits. Ural. *Proceedings of universities. Mining journal*, (6), 46-50.

34. Khayitov, O. G. (2019). On the formation of abnormally high and abnormally low reservoir pressures. In *VI International Scientific And Practical Conference.«Global science and innovations* (pp. 82-86).

35. Shafievich, A. B., Gafurovich, K. O., & Charcoal, N. J. F. (2017). Oil displacement by water in an electric field. *Austrian Journal of Technical and Natural Sciences*, (3-4).

36. G'afurovich, K. O. (2020). Modern State And Methods Of Enhancing The Productivity Of Field Progress In The South-Eastern Part Of Bukhara-Khiva Region. *The American Journal of Social Science and Education Innovations*, *2*(09), 423-432.

37. Hayitov, O. G. (2013). NabiyevaN. To., Mahmudov Sh. N. The evaluation of the impact of well spacing on oil recovery factor oil of oil deposits. *Izvestiya vuzov. Mining journal". Uralsky*, (6), 46-50.

38. Shafievich, A. B., & Gafurovich, K. O. Section 5. Mechanics. *Austrian Journal of Technical and Natural Sciences*, 20.

39. Zikirov, M. C., Qosimova, S. F., & Qosimov, L. M. (2021). Direction of modern design

activities. *Asian Journal of Multidimensional Research (AJMR)*, *10*(2), 11-18.

40. Avazovna, A. H., & Gafurovich, K. O. Section 4. Technical science. *Austrian Journal of Technical and Natural Sciences*, 16.