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DEVELOPMENT OF EFFECTIVE COMPOSITIONS OF THERMAL-SALT-RESISTANT COMPOSITE CHEMICALS USING LOCAL AND SECONDARY MATERIALS

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ABSTRACT

The article presents the results of research on the development of effective compositions of thermo-salt-resistant composite chemical reagents using local and secondary materials. Due to the high salinity of the reservoir water for the preparation of drilling fluids, water is brought from long distances and costs increase significantly. Based on the conducted research, we propose to introduce 3-20% (depending on the amount) of the KHR-R reagent to the composition of the drilling mud as an acid-soluble additive when opening fractured oil and gas reservoirs.

KEYWORDS: *Composition, Chemical Reagent, Drilling Fluids.*

INTRODUCTION

The big problem today facing the drillers of the oil and gas industry of our republic is the creation of reliable and affordable chemical reagents and drilling fluids that are resistant to the aggressive effects of high-pressure, highly mineralized water during rapaproyavlenie, used when drilling the salt-bearing strata of fairly stable rocks. The thickness of the rapaproyavleniya is from 500 to 1500 meters at the depth of the well 1500-3000 meters.

Brine consists mainly of melts of magnesium chloride ($MgCl_2$) and magnesium sulfate ($MgSO_4$) salts. When drilling salt deposits, the melt of these salts under reservoir pressure begins to push the working drilling fluid out of the well. As the upper zones of the borehole are reached, the melt cools and, when mixed with the working drilling fluid, crystallizes, which leads to the capture of the drilling tool. Most often, drilling operations are stopped and this well is preserved. Currently, there are several dozen such preserved wells in the western fields of Uzbekistan (Beshkent, Kultak, Zevasi, Pamuk), for which multimillion-dollar financial resources have been spent {1}.

The composite chemical reagents and drilling fluids based on them developed by us will be heat-resistant, will allow to deconservate the above-mentioned wells and accelerate the opening of productive horizons in these fields.

Another important problem is the use of reservoir water for the preparation of drilling fluids. Due to the high salinity of the reservoir water for the preparation of drilling fluids, water is brought from long distances and costs increase significantly. The composite chemical reagents developed by us will make it possible to obtain rapa-resistant drilling fluids using highly mineralized reservoir waters.

Thus, the development of technology for the production of composite chemical reagents for the preparation of rapa-resistant drilling fluids using highly mineralized reservoir waters is a very urgent problem {1-3}.

Research objects. The objects of research are caustic and soda ash, carboxymethylcellulose-CMC, polyacrylamide (PAA) and some inorganic mineral ingredients. Recently, in the course of carrying out research work on the development of effective composite chemical reagents for clay-free drilling fluids, we have chosen the composite chemical reagent-rapaproyavleniya (KHR-R) as the object of research.

Research methods. In determining the physical, chemical and operational characteristics of the developed composite materials, as well as organic and inorganic ingredients, methods, devices and installations were used in accordance with the relevant GOST standards adopted in the CIS.

The results of the study. The steady increase in the share of deep exploration drilling in the total volume of drilling operations constantly requires the creation and introduction of highly effective, cheap and affordable chemical reagents – stabilizers of drilling fluids.

Currently, when drilling oil and gas wells, a wide variety of chemicals necessary for drilling fluids, both domestic and foreign production, such as CMC, K-4, K-9, GIPAN, SSB, CSSB, NaOH, $CaCO_3$, USHR and others, are used, which are expensive and many of them are imported to Uzbekistan from abroad. However, these reagents do not always meet the requirements for reagents used in the complicated geological and technical conditions of Uzbekistan {4-5}.

We have developed composite chemical reagents for drilling in saline and chemical aggressive environments since it is stable to cations in polyvalent salts (Mg^{++}, Ca^{++}, Na^{+}, K^{+}). When developing new composite chemical reagents, we used local raw materials, waste from food production and waste from non-ferrous metallurgy. The main physical and chemical properties of the composite chemical reagent KHR-R (composite chemical reagent-rapaproyavleniya) are given in Table № 1.

TABLE №1 PHYSICO-CHEMICAL PROPERTIES OF THE COMPOSITE CHEMICAL REAGENT-RAPOPROYAVLENIE (KHR-R)

№	Name of indicators	Characteristics of the norm
1	Color	from light brown to brown
2	Consistency	Solid powder
3	Specific gravity, g/cm3	1,10
4	Solubility in water, %	97
5	Main substance, %	75
6	Mass fraction of total fat to the mass of KHR-R,%, not less	5,5
7	Conditional viscosity of 10 % solution, s	24
8	Acidity, 10% solution	11
9	Humidity, %	5

From Tables No. 1, it can be seen that the composite chemical reagent-rapoprevention has qualitative characteristics when used for drilling fluids, such as high acidity, water solubility, and partially affects the filtration of solutions.

At the suggestion of JSC "Uzgeoburneftegaz", laboratory tests were carried out in the Service Service for drilling and cement solutions of JSC "Neftegazispytanie" to obtain a weighted drilling mud based on the developed composite chemical reagent-rapaproyavlenie (KHR-R). The results of laboratory tests to obtain a formulation of weighted drilling mud based on the chemical agent KHR-R are shown in Table No. 2.

TABLE № 2 TECHNOLOGICAL PARAMETERS OF WEIGHTED DRILLING MUD BASED ON KHR-R AND BARIT (UZBEKISTAN)

№	Composition of weighted drilling mud	ρ, g/sm^3	T_{500}, s	F, sm^3/30 min	$T_к$, mm	pH
1.	1000 ml R-Solution (Chulkuvar 39)	1,34	52	10	1,2	9
2.	No. 1 r-r + 100 g NaCl	1,38	64	12	1,5	7
3.	No. 2 r-r +60 g KHR-R	1,32	69	8	1,0	9
4.	No. 3 r-r +100 ml Oil	1,34	72	8	1,0	9
5	No. 4 r-r +1000 g barit (Uzbekistan)	1,81	195	8	1,0	9
6	After heating at 80 ^{0}C	1,81	90	8	1,0	9
7	No. 4 r-r + 5 g CMC 80^{0}C	1,81	148	5,5	0,8	9

Table 2 shows that it is possible to obtain a weighted drilling mud with a density of 1.81 g/sm^3 based on the chemical agent KHR-R and CMC of Namangan production. The acidity of the weighted drilling mud based on the chemical agent KHR-P is reached to 9 without the addition of caustic or soda ash.

The composite chemical reagent-rapoprevention (CCR-R) also has a positive effect on the filtration properties as it has decreased from 12 sm^3/30 min to 8 sm^3/30 min. According to the results of the conducted laboratory tests, a production test was recommended at the fields No. 39 Chulkuvar of Uzgeoburneftegaz.

In well No. 39 Chulkuvar, production tests of weighted drilling mud based on composite chemical reagent-rapaproyavleniya (KHR-R) and CMC of Namangan production (CarboNam) were carried out. The well uses a rotary type of drilling design depth of 3600 m, salt-anhydrite strata from 2800 to 3200 m drilled with weighted drilling fluids based on the chemical agent KHR-R and CMC (CarboNam). The results of the production tests carried out in the well No. 39 Chulkuvar are shown in Table № 3.

TABLE № 3 TECHNOLOGICAL PARAMETERS OF WEIGHTED DRILLING MUD BASED ON THE COMPOSITE CHEMICAL REAGENT KHR-R

№	Date	Go deep on, m	Composition of treated weighted drilling mud	Specific gravity, g/sm^3	Viscosit, T,s	Water recoil, sm^3/30 min	pH	Crust, mm
1	4.03	2808	Initial clay solution	1,34	52	10	8	1,2
2	5.03	2808	Initial Solution + KHR-R (5%) + Oil (5%) + CMC (0.5 %) + NaCl (2%) + Barite (40%)	1,60	56	8	9	1,0
3	6.03	2808	Initial solution + KHR-R (4%) + Oil (4%) + CMC (0.5%) + NaCl (2%) +Barite (30%)	1,76	58	8	9	0,8
4	7.03	2808-2812	Initial solution + KHR-R (2%) + Oil (1%) + CMC (0.4%) + NaCl (2) + Barite (10%)	1,80	61	7	9	0,7
5	8.03	2812-2864	Working solution + KHR-R (1%) + Oil (1%) + CMC (0.4%) + Barite (4%)	1,81	62	6	9	0,7
6	9.03	2864-2920	Working solution + KHR-R (1%) + Oil (1%) + CMC (0.4%) + Barite (4%)	1,82	63	6	9	0,6
7	10.03	2920-3092	Working solution + Na_2CO_3 (0.5%) + CMC (0.4%) + CarboPac (0.1% kg) + NaOH (0.1%) + Barite(4%)	1,83	65	5	9	0,5
8	11.03	3092-3200	Working solution + Na_2CO_3 (0.5%) + CarboPac (0.2%) + NaOH (0.1%) + Barite (4%)	1,84	68	5	9	0,5

After conducting a production test of the composite chemical reagent-rapaproyavlenie (KHR-R) at well No. 39 Chulkuvar to obtain weighted drilling mud, it can be seen that all the technological parameters of the drilling mud meet the standards specified in the GTN. With increasing concentration (KHR-R), the alkalinity of the solution increases, the filtration of the solution decreases, and the specific gravity steadily increases to the required value, since from 1.34 to 1.84 g/sm3.

CONCLUSIONS

Thus, the KHR-R reagent developed by us allows us to comprehensively solve these problems and fully meets the requirements that are imposed on drilling fluids used in complicated geological conditions and in areas with highly mineralized reservoir waters and rapaproyav leniyami. The KHR-R reagent developed by us with the use of waste from various industries and local raw materials contributes to solving this problem and intensifying oil and gas production, hence increasing their production volume. Based on the conducted studies, a good compatibility of KHR-R with widely used chemical reagents (YSHR, K-4, CMC i gipan) in the composition of drilling fluids was revealed. Based on the conducted research, we propose to introduce 3-20% (depending on the amount) of the KHR-R reagent to the composition of the drilling mud as an acid-soluble additive when opening fractured oil and gas reservoirs. The addition of KHR-R to the drilling fluid composition will prevent irreversible blockage of cracks and pores of the productive formation with clay and the solid phase of the solution, will help preserve the natural permeability of oil and gas reservoirs, reduce the time of well development and lead to an increase in oil production. According to the positive technological parameters of the weighted drilling mud based on the composite chemical reagent-rapaproyavlenie (KHR-R) is recommended for drilling wells with salt-anhydrite deposits in the fields of JSC "Uzgeoburneftegaz".

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