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Development of New Composite Chemical Reagents and Their Implementation

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ABSTRACT: The research paper shows that the development of new composite chemicals for drilling fluids, methods their testing and implementation. In the research work given chemical and physical properties of chemicals, methods and results of their testing, as well as the development of drilling fluids based on composite chemical reagents.

KEYWORDS: Chemical reagent, drilling fluid, wells, method, density, viscosity, polymer, oil, gas, barite.

I. INTRODUCTION

Presently, the economy of the Republic of Uzbekistan plays an important role in the fuel and energy sector, in particular, the oil and gas industry. Every year natural gas production is about 60 billion m³ or more, produces 8 million tons of oil and gas condensate. New fields are opening and continuing exploration and drilling. Accordingly, the volume of producing finished products will be increased. For the development of oil and gas fields is necessary to drill several million meters of wells. In the drilling of wells is consumed thousands of tons of expensive chemicals as an organic and inorganic origin. In connection with the development of deep drilling is characterized by high reservoir pressure, high bottom-hole temperatures, increased salt aggression as magnesium and calcium, brine, properties of chemicals and drilling fluids to meet the geological technical norm are placed more stringent requirements. [1,2,3].

A successful oil well drilling depends largely on a good mud Program. During drilling, mud provides sufficient hydrostatic pressure, removes drill cuttings and cools drill bits. Mud additives are always required to provide sufficient hydrostatic pressure to ensure borehole stability. Barium Sulphate (BaSO₄) also known as barite is the prevalent weighting material but there is a need to develop local materials to augment the use of Barite. This study was aimed at assessing the suitability of galena, a lead sulfide (PbS), as an alternative weighting material in drilling fluids [4].

II. MATERIALS AND METHODS

Nowadays, for obtaining and processing of drilling fluids are used a variety of chemicals, such as Carboxymethylcellulose, Condensed sulphite alcohol tar, Hydrolyzed polyacrylonitrile, Hydrolyzed polyacrylamide. Ferrochrome lignosulfonates, Graphite, Chrompick, POLY-ANTS and others². The need of the Republic on chemical reagents for drilling fluids is about 3000 ton per year. Domestic chemicals are not fully meet the requirements geological condition and imported reagents are expensive and bought for foreign currency. As weighting materials are used barite, hematite, dolomite, marble flour, etc. Drilling salt - anhydrite stratum wells is a complex process. When drilling salt-anhydrite thicker wells, the number of complications greatly increases for drilling efficiency and impede the operation of



wells. Drilling fluids, in this case, play an important role, as they must have such properties as stability, salt-resistance, heat resistance, resistance to chemical attack and lubricating properties. [4]

Used drilling fluids do not always meet the performance requirements in the complicated geological conditions. When drilling oil and gas wells, several complications, significantly reducing the efficiency of drilling operations and impede the operation of wells. Has worsened the quality and efficiency of used drilling fluids. This leads to various types of accidents: a collapse, sedimentation solid phase, slip salt restriction reservoir, collapse casing pipe, drill pipe drag, the loss rate of penetration, etc. To solve this problem we have developed and recommended new formulations and technology for effective composite chemical reagent - for heavy mud from waste chemical, metallurgical, food and other industries and ingredients from local raw materials. This makes it possible to obtain the weighted drilling muds with densities from 1.45 to 2.1 g / cm³ using highly mineralized formation waters. With the development of effective composite chemicals, we used gossypol resin and various inorganic ingredients.[5]

Gossypol chemically active, capable of reacting phenol and an aldehyde compound. In gossypol resin found 10-12% of nitrogen compounds 36% conversion products gossypol and up to 52% of the fatty acids. Research results confirmed that the IR spectroscopic method of analysis. It consists of a multifunctional compound shows high reactivity. Also has antioxidant properties. Gossypol contained (on average 1%) as nuclei and other parts of the seed cotton. The study of waste oil and fat production - gossypol resin found that it possesses several reactive groups in the modification with soda and alyumak which is a waste of production and processing of non-ferrous metals and plays a catalytic role in the transition of the resin from viscous-flow gossypol to powdered water-soluble state. The water solubility of the developed composite chemical reagent is 95-98% and provides a good lubricant, water-repellent, and the stabilizing effect of heavy mud. For obtaining stable weighted drilling fluids. Determination of physical and chemical properties of drilling fluids [6].

Determination of Mud Density. The weight of the mud samples was determined using the Baroid mud balance. The cup was filled with mud after calibration. The expelled mud was washed and the balanced arm was replaced on the base with the knife-edge resting on the fulcrum.

Determination of Mud Viscosity The mud viscosity of the samples was determined using Fann V-G meter. The Fann VG meter was filled to the 350 cc mark and placed on the movable work table. The table was adjusted until the mud surface was at the scribed line on the rotor sleeve. The motor was started with a high-speed position (600 rpm) and the reading was taken from a steady indicator dial value. The reading was also obtained at a low speed of 300 rpm [4].

Determination of pH. The pH meter which consists of a glass electrode system, an electronic amplifier and a meter calibrated in pH units was used to test the pH of galena mud. The electrical connection with the mud was established through a saturated KCl solution contained in a tube surrounding the calomel cell. The electrical potential generated in the glass - electrode system by the hydrogen ions in the drilling mud was amplified and operated the calibrated meter which indicated the pH. [4].

Determination of stability and sedimentation indicators. Stability - The ability of a solution to its density over a period of time. The stability index S is a value determined by the difference in densities of the lower and upper parts of the drilling mud settled for a certain time. Sedimentation index S,% is the value determined by the amount of the dispersed phase, separated from a certain volume of the drilling fluid as a result of the gravitational separation of its components for a certain time. The sedimentation rate indirectly characterizes the stability of the drilling fluid.

III. RESULTS

Composite chemical reagents have been developed for drilling of salt and chemical aggressive environments, as they are stable salts of polyvalent cations as (Mg⁺⁺, Ca⁺⁺, Na⁺, K⁺). Composite chemical reagents have high lubricity due to its content in the composition of about 35-40% of the polymerized fatty acids, pigment, glycerin and other components, which serve to emulsify the oil and water. Specific gravity about 1.1 g/cm³, the viscosity of a 10% water solution is 25 s, the hydrogen component is 12. The composite chemical reagent also possesses the quality characteristics of drilling fluids so it gives high pH, and it partially positive impacts on the filtration characteristics of drilling fluids therefore long lifetime use. At the suggestion of JSC "Uzgeoburneftegaz" for service of drilling and cement grout of the laboratory tests were conducted to obtain the weighted drilling fluids developed on the basis of the composite chemical reagent. The results of laboratory tests are shown in Fig 1.

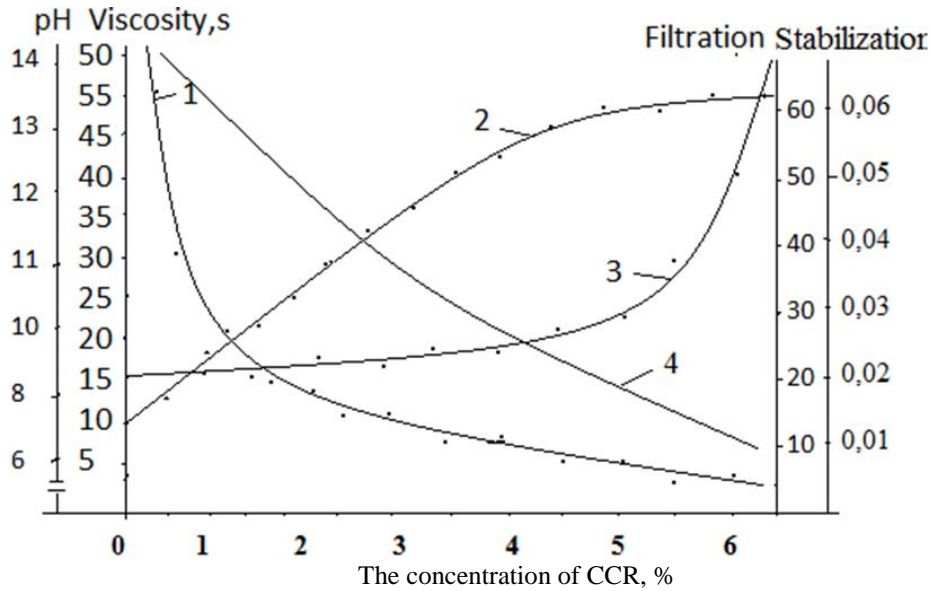


Figure 1. Dependence of water filtration (1), pH(2), Viscosity (3) and stabilization (4) from the concentration of CCR.

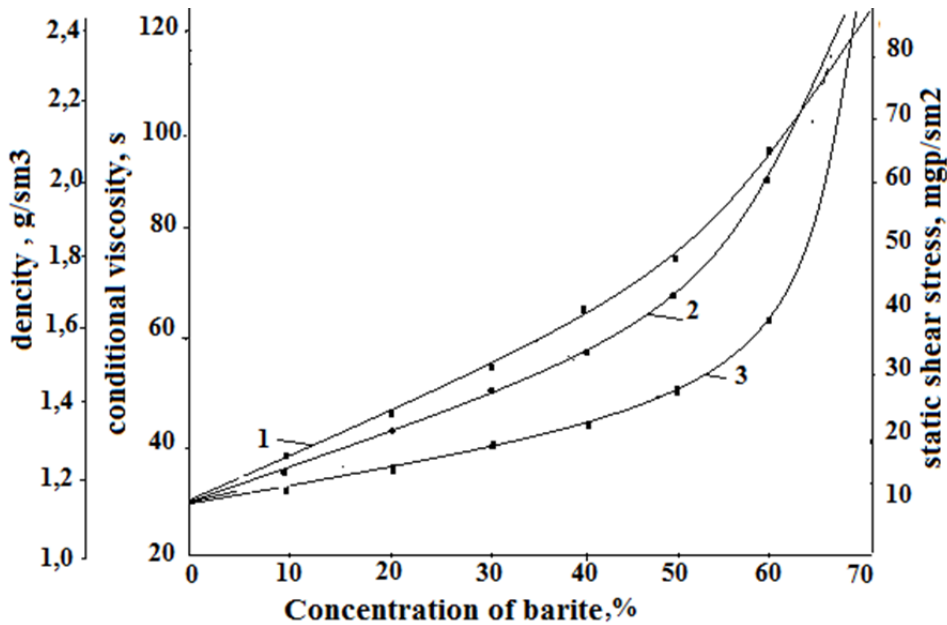


Figure 2. Dependence of density(1), conditional viscosity and static shear stress (3) from the concentration of barite weighted drilling fluids based on composite chemical reagent

The results of laboratory testing show that on basis of the composite chemical reagent CCR, CMC and barite we can receive weighted drilling fluid with a density of 1,45-2,25 g/cm³. The pH of the heavy mud on basis of the composite chemical reagent reaches 9-10 or without the addition of caustic soda. Concentration barite is 40-60%. The composite chemical reagent also has a positive effect on the flow properties as well as filtering solution decreased from 12 to 6-8 cm³/30 min. Stabilization drilling fluid is one of the main physic-chemical property of drilling mud. Stability drilling



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fluid is the ability of a solution to hold particle weighted distribution. It determinates the quantity difference of density bottom and the top half of the drilling fluid sediment in 24 hours.

According to the results of the laboratory tests, it has been recommended production testing at the borehole №39 Chilkovar AK "Uzbekneftegaz" field.

IV. DISCUSSION

The technological parameters of drilling fluid before testing were the following: density - 1.34 g/cm³, viscosity-52 s, water filtration - 10 cm³/30 min and pH-8. On the Oil and Gas borehole №39 Chilkovar the production tests were carried out heavy mud, obtained on the basis of the composite chemical reagent CCR and Na-Carboxymethylcellulose (Na-CMC) Namangan production of "Carbonam", Caustic, soda ash and some polymer reagents. For drilling borehole used of rotary type drilling. The project depth of 3600 m slaughter. Salt-anhydrite strata were from 2800 to 3200 m. The salinity of formation water well is 15 to 20%, mainly contains salt as Mg⁺⁺-300 mg/l, Ca⁺⁺-120 mg/l, NaCl-199,943 g/l and KCl-152,655 g/l.

The results of the production tests №39 Chilkovar deposits show that technological parameters of heavy mud on the basis of the composite chemical reagent fully meet the requirements of geology-technical condition. Composition of the heavy mud consists of Carboxymethylcellulose, CCR, oil, water and barite. Technological parameters of heavy mud were positive, weight 1,75-1,82 g/cm³, viscosity 60-80 s, filtration 4-8 cm³/30 min, pH 9-10 and stability 0,3 g/cm³. Have been drilled 2800-3200 meters depth of salt layer without any accident.

After the trial testing of the composite chemical reagent at the well №39 Chilkovar deposits to obtain heavy mud for drilling wells of salt deposits in the range from 2800 slaughter of 3200 meters, you can see that all the technological parameters of drilling fluid meet the standards specified in the geological-technical norm. With increasing concentrations of the chemical reagent composition increases the alkalinity of the solution, filtering the solution decreases, steadily increases proportion to the desired value. Heavy mud on the basis of the composite chemical reagent for positive technological parameters recommended for drilling of wells with salt - anhydrite deposits Stock company "Uzbekneftegaz."

The work has been done according to Government innovation applied project "Development effective technology of obtaining composite chemical reagent for weighted mud release from casing pipe mobility loss" and Innovation project "Development export-oriented effective receipt of composite polymer reagents and drilling fluids on its base using the waste of food industry and other ingredients for drilling productive horizon on Ustyurt field". Innovation work contract "Effective composite reagents for drilling oil and gas wells with abnormally high reservoir pressures"

V. CONCLUSION

New composite chemical reagents type CCR have following advantages compare with existent drilling agents:

- Decreases speed of sedimentation process by formation hydrophobic film on the surface weighting agents
- Salt stable because of having active functional groups
- Thermal stable
- Long lifetime
- Have multifunction
- Decreases chemical consumption
- Ecological safe
- Results of laboratory and industrial testing show that using composite chemical reagent CCR for obtaining heavy mud was stable and the drilling speed increase by 15-20% without any accident, therefore, drilling costs decrease by 10-15%. In conclusion, positive physical-chemical properties of gossypol resin and obtaining effective water-soluble powder composite chemical reagent on its base is effective for obtaining weighted drilling fluids.



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