

Development of blocking hydrophobic-emulsion composition at well killing before well servicing

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Abstract. In modern conditions reduction of volumes oil recovery and steady growth of the cost price of its extraction demands other approach to a choice of type, technological parameters and ecological cleanliness used well killing fluid. Reception importance from each well of the maximal feedback does not allow to apply such structures which cause deterioration work's parameters of wells and reservoir properties of bottom-hole formation zone. In the article results of the blocking hydrophobic-emulsion compositions development laboratory investigations are shown. The material is used to keep filtration characteristics of a formation pay zone during well killing before well servicing.

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Introduction

Oil-field experience testifies that among the methods used for preservation and improvement filtration characteristics of bottom-hole formation zone, and technological oil branch it is possible to count the most effective chemical methods [1, 2].

Among the reasons resulting in decrease filtration properties of productive layers at use in quality well killing fluid of water solutions of inorganic salts during carrying out of well servicing and other operations, the most often are [2, 3, 4]:

- absorption of technological fluid by a productive layer or its saturation by a filtrate;
- the pores of layer is colmataged by firm phase particles of a technological fluid;
- swelling a clay material of a layer as a result of interaction with a filtrate of a technological fluid;
- formation of insoluble deposits in bottom-hole formation zone as a result of contact technological fluid with formation fluids and changes of temperature.

Main part

For exception of negative influence traditionally used fluid of muffling on bottom-hole formation zone it is offered to use blocking hydrophobic-emulsion composition injecting in a well before replacement well's fluid on a water solution of inorganic salts. Blocking hydrophobic-emulsion composition represents return water-oil emulsion formula stabilized highly effective emulsifier. Application of invert emulsion thus [3, 5, 6]:

- provides prevention of penetration into a productive layer of a well killing fluid's filtrate;
- promotes restoration and improvement of conditions of a filtration of oil in bottom-hole formation zone possessing surface-active, waterproofing and water-absorbing properties.

The invert emulsion do not cause corrosion destruction of the equipment, but also in many cases reduce to a minimum its current [7]. Blocking hydrophobic-emulsion composition possess high resolving ability in relation to such aggressive gases as hydrogen sulphide and carbonic gas that prevents allocation of these gases on a mouth of a well and does not cause a poisoning of the attendants. At use of the opposites emulsion abrasive deterioration of the equipment is essentially reduced, microbiological processes are prevented. These emulsions are not subject to infection sulphate recreational and other kinds of bacteria. Advantage also is absence of negative work influence of installations on preparation oil [1, 8, 9].

The detailed information is necessary for correct choice. Blocking hydrophobic-emulsion composition under the characteristic of a layer a design of a well and a mode of operation. On the basis of the laboratory researches (Table 1) and generalizations of an operational experience are formulated the main requirements to the opposites emulsions, used in oil extracting [2, 3, 10]:

- adjustable density over a wide range;
- presence of properties necessary structure rheological and their adjustability;

- presence of the certain values of a gel strength lowering depth of penetration into a layer;
- stability in time, and also stability to temperature influence;
- low corrosion activity;
- the maximal preservation collecting properties of a layer.

Table 1. Technical characteristics of the blocking hydrophobic-emulsion compositions

Parameter	Range of values
density, g/cm ³	0,9-1,3
dynamic viscosity, mPa·s	200-3040
gel strength, Pa	2,2-52,8
thermostability, °C	80-90
speed of corrosion, g/m ² ·hour	0,07-0,14
factor of restoration of permeability (for oil), %	80-95

The density is adjustable size and depends according to the carried out laboratory researches developed blocking hydrophobic-emulsion composition on density of the dispersive environment (a hydrocarbonic solution emulsifier), density of a disperse emulsion's phase and from a ratio of phases water/oil. The range of change blocking hydrophobic-emulsion composition density makes 0,90-1,30 g/cm³ at use as a disperse phase of water solution CaCl₂. For achievement of the greater density use of the salt solutions having higher density, for example water solutions of chloride calcium with chloride zinc is possible. The opportunity of increase in density of structure up to 1,2-1,3 g/cm³ allows to use it in small volumes (2-4 m³) for filling, for example, only zones of a productive layer.

Rheological researches have made important part in the general research on selection and optimization emulsion's structures. Rheological properties were studied on rotational Brookfield viscosity in range of speeds shift 7,3-73,2 sec⁻¹. Values depend on the quantitative contents of a disperse phase in opposite emulsion practically all its technological parameters. Viscosity of the blocking hydrophobic-emulsion compositions depends on share rate and grows when content of inner phase increases. Substantial growth of viscosity is observed at the contents of a disperse phase more than 70% such viscosity creates difficulties at prorolling by chisel pumps. At use of structure with a ratio of phases water/oil from 50/50 up to 70/30 blocking hydrophobic-emulsion compositions viscosity will be within limits of 200-3040 mPa·s.

The gel strength characterizes durability emulsion's thixotropic structure in a condition of rest.

With increase in the contents of a disperse phase growth of gel strength values according to which it is possible to choose blocking hydrophobic-emulsion compositions with gel strength values corresponding to technical requirements is observed.

The high protective properties, investigated blocking hydrophobic-emulsion compositions in relation to metals speak that the hydrocarbonic component (an external phase) adjoins to a metal surface which in turn oil soluble surface-active substance (emulsifier) and prevents contacting this surface with solutions of salts [7].

By laboratory researches it is established, that the factor of restoration of bottom-hole formation zone permeability at contact to the opposites emulsions makes 0,80-0,95 and at contact to systems on a water basis – 0,05-0,35. In latter case permeability on oil is reduced in 2-6 times. Thus well killing operation with invert emulsions may be accompanied by keeping initial oil rates of a production wells after well servicing and easiness of a well completion.

Summary

1. Developed the blocking hydrophobic-emulsion compositions which is used to keep filtration characteristics of a formation pay zone during well killing before well servicing. The composition is placed in the well opposite to perforation interval under traditionally used water based well killing fluids.

2. Main advantage of the developed blocking hydrophobic-emulsion compositions over traditionally used water based well killing fluids is a possibility to adjust the technological parameters of the emulsion material by means of type and content of inner (disperse) phase regulation.

3. Well killing operation with blocking hydrophobic-emulsion compositions may provide keeping initial oil rates of the production wells and reduction of a well completion procedure and bringing the well to stable production times.

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