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BOOK OF ABSTRACTS

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4. **Osennii V. IA., Osenniaia N. V**. O kotlovoi polosti i ratsionalnoi konstruktsii zariada pri otboike krepkikh rud v podzemnykh usloviiakh Materialy konferentsii Razrabotka i ekologicheskaia bezopasnost sovremennykh granulirovannykh i emulsionnykh vzryvchatykh veshchestv, Kremenchuk, 2013, p. 39-41.

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USE OF THERMAL AND MAGNETIC DEVICES FOR PREVENTION OF ASPHALTENE, RESIN, AND WAX DEPOSITS ON OIL EQUIPMENT SURFACES

Extraction of liquid hydrocarbons is often complicated by the presence of asphaltene or resin and wax deposits in them, which causes formation of deposits inside the tubing string. Over time, these deposits - hydrocarbons methane from C16H34 to C64H130, silica gel resins, asphalt-resinous compounds, hydrates, and others - worsen, and, in some cases, make it impossible to extract liquid products, since they gradually obturate the passage section of the tubing string.

Insufficient presence of complexes for the prevention of ARWD on oil and gas equipment market, and the tendency to implement combined technological complexes, which are made on the basis of magneto-electrical devices (thermal-magnetic dewaxing units), and also the design of a multi-level complex for deposits prevention should allow placement of thermal-magnetic dewaxing complexes in the zone with a higher level of such deposits.

Crude oil is a complex chemical composition of components which, depending on the structure and the external environment, may be in different states of aggregation. Temperature reduction causes a

change in the physical state of the components, leading to the formation of paraffin crystallization centers and their growth [1].

The intensity of the ARWD formation depends on the predominance of one or more factors that can vary in time and depth, so the number and nature of the deposits are not constant.

the most promising means of ARWD removal among the existing ones are magnetic devices. They do not change the chemical composition of the formation fluid, are not harmful to the environment, in most cases are installed at an arbitrary interval of tubing string pulling unit and are efficient.

To use magnetic devices, it is necessary to ensure the following conditions: gas factor (20-300 m^3/m^3), the presence of the micro-impurities in the form of iron ferromagnetic particles in the wells, the content of asphaltene and resins not less than the content of wax in oil, etc.

Laboratory studies have shown that the rate of wax formation affects allocation process and behavior of gas bubbles in the flow of mixture. It is known that gas bubbles can float suspended wax particles. When bubbles contact the tubes surface, wax particles come in contact with the wall and deposit on it.

On the following, the process of wax deposition increases because of its hydrophobicity. On the wall of the tube, is formed a layer of wax crystals and bubbles in the gas. The smaller gas-saturated layer, the greater density it has. Therefore, denser sediments are formed at the bottom of the lifting pipes where gas bubbles are small and have greater strength adhesion to wax crystals and tube walls [1-2].

The intensity of ARWD formation largely depends on the rate of fluid flow. At low flow rates, the formation of ARWD is quite slow. With speed increase (at transition to turbulent flow regime) deposits intensity initially increases. Further increase of liquid-gas mixture speed (LGM) leads to decrease of ARDW intensity, as the high rate of fluid flow allows wax to keep the crystals in suspension state and take them out of the well. Furthermore, the flow tears a part of deposits from the walls of the pipes, which explains the decrease of deposits in the range of 0-50 m from the wellhead. At high speeds, the flow of the mixture cools slower than at lower ones. Likewise, at low speeds, the formation of ARPD slows.

According to the results of industrial enterprises research, the ARWD appear at intervals of 500-900 m (in some cases, from 1200 m), which is explained by positive conditions: the temperature of the fluid decreases to 17-20°C, degassing within this interval, decrease in pressure, etc. The depth of the deposits layer on the inner walls of the tubing can reach 30 mm and more – until the closure of the passage section of the tubing string. At this interval, there is a need for the use of equipment to prevent this situation or deposition [1-3].

Application of a magnetic device allowed increase in the average repair time of wells, complicated by the formation of emulsions and ARWD, on average by 2 times. The introduction of a magnetic device in wells, complicated by the formation of ARWD, has allowed doubling the overhaul period during the chemical treatment of wells.

The use of thermal-magnetic dewaxing units is aimed at increasing the overhaul period of wells due to the action of the directed magnetic field and thermal energy. The mechanism of thermal-magnetic dewaxing device action is directed to the change in the viscosity of the liquid passing through the device.

The use of thermal-magnetic dewaxing devices can be effective at the operation of wells with deep-well, centrifugal and diaphragm pumps, as well as on oil pipelines.

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