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METHODS FOR DETERMINING THE EFFECTIVENESS OF INHIBITORS

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ABSTRACT

The test is carried out in the following sequence.
The flask is filled with 50 ml of oil with the addition of 0.02% (by weight) inhibitor and stir for 3-5 minutes. Pour the solution into a test tube and incubate for 20 minutes. Then the solution is transferred from the test tube to the flask, and the test tube is filled with 0.5 volumes of formation water from the field being studied. The remaining volume is filled with oil from the flask. The test tube is closed, and then inverted and the stopwatch is turned on, recording the flushing of the oil film over time.

KEYWORDS

Introduction

Method of dispersion and washing of ASPD. This method is as follows. 0.5 ml of reagent is dosed into 50 ml of formation water and 2.5 g of paraffin is placed. The contents of the flask are heated, stirring until the paraffin is completely melted. Then the flasks are cooled with a stream of tap water and the dispersion of paraffin deposits, adhesion to the walls of the flask and smearing are recorded.

Cold cylinder method. Evaluation of the effectiveness of the inhibitor by this method consists of heating a certain amount of oil, namely 400 ml, and 48 g of crushed paraffin in a thermostatic bath to 90 ° C, followed by introducing a microsyringe into the inhibitor solution in quantities of 0.02; 0.04; 0.08; 0.1 ml.

The temperature of the oil at the beginning of the experiment should be below the temperature of paraffin dissolution in oil, and the temperature of the “cold” surface of the glass should be below the temperature at which paraffin crystallization begins. After heating to 65 °C, the glass is removed from the bath and a cylinder is lowered into it, which is cooled for 20–30 minutes with tap water. Then the cylinder is cooled in air for 10 minutes so that oil drains from its surface.

Next, hot water is passed through the cylinder, and deposits are washed away into a glass placed under the cylinder.

The mass of washed deposits at various doses of the inhibitor is a measure of the effectiveness of its action.

Field testing of ARPD removing reagents. Waste and by-products of the Samara synthetic rubber plant, containing hydrocarbons of the methane, benzene and diethylene series (piperylene fraction), as well as heavy hydrocarbons, were used as paraffin deposit rem The experiment used oils from a number of wells. For comparison, well-known solvents were taken - gasoline, kerosene and benzene.

It has been established that the piperylene fraction can compete in efficiency with well-known and expensive solvents - gasoline and kerosene.

The technology provided:

a) injection of 9 m3 of sediment solvent into the flowline with an idle well using the AN-700 unit;

b) holding the reagent for 90 minutes;

c) putting the well into operation.

The surface of the pipe after this treatment was washed almost completely. The duration of operation of a well with a flow rate of 116 m3/day between two treatments is from 30 to 75 days.

Using a hot solvent to remove paraffin. Experience in the use of solvents has shown that with an increase in temperature to 60 °C, the rate of dissolution of paraffin is increased by 4 times. For this purpose, a special heater was developed, which is a “pipe-in-pipe” heat exchanger. The coolant from the steam mobile unit is pumped into the annular space of the heat exchanger, and the heated solvent is supplied by the pumping unit to the central pipe communicating with the well fittings.

At a flow rate of 2 l/s and a temperature of 60–70 °C, the solvent is dosed into the well. The well treatment technology consists of the following operations.

Steam from the polyurethane foam is supplied simultaneously with the solvent to the heater. It is recommended to maintain the steam pressure no more than 1.5 MPa, and the temperature no less than 200 °C. Solvent in a volume of 4 m3 is fed into the tubing to the area located below the boundary of intense paraffin release from oil, i.e. to a depth of 1000–1100 m.

After pumping the solvent into the tubing, the well is left to “react” for 2 hours and then put into operation. During repair work to clean the tubing and production casing, it is recommended to raise the tubing to a depth of 500 m and perform circulation flushing with a hot solvent in a volume of 8–9 m3.

The main indicator of the technical and economic efficiency of the described technology is the increase in the inter-treatment period of the well, as well as the change in oil and gas flow rate throughout the entire period of well operation.

Methods for supplying an inhibitor to a well and assessing their effectiveness. As noted earlier, several methods of supplying inhibitors to oil wells have been used in the fields - periodic and supply into the annulus by wellhead dispensers.

The periodic method involves a one-time “pressure” of a certain volume of solution into the formation by a pumping unit through the annulus of the well or tubing without lifting the equipment. This method is simple and technologically advanced, however, as the researchers note, it is very expensive, since it does not last long. According to the data, in the first time after crushing, the main amount of inhibitor is carried out along with the extracted liquid.

Supplying solution into the annulus using wellhead dispensers requires the installation of dosing pumps, which does not present any technical difficulties. But, as the authors of the work note based on the research, annular dosing also requires increased consumption of the reagent due to the loss of its activity during the passage of a significant column of gas-liquid mixture from the mouth to the shoe.

The most appropriate is the downhole supply of the inhibitor. With the fountain extraction method, several dispenser designs can be used for this purpose.

The volume of the reagent, and therefore the number of tubing forming the container, is selected based on the planned dose of the reagent and the turnaround period of the flowing well.

Express method. This article describes express methods for determining the effectiveness of used ARPD inhibitors, determining the optimal concentrations of chemicals introduced for the first time, the effectiveness of pipe coating with different materials, as well as the optimal concentrations of detergent compositions. Methods for assessing the effectiveness of chemicals and coatings against paraffin deposits are based on determining the rate at which oil films are washed off from various surfaces in an aquatic environment. The method is based on the fact that any surface first adsorbs the asphalt-resin components of oil and only then deposits form on this adsorption film. The exposure time of materials in oil and water is selected based on their adsorption activity, which, to a first approximation, depends on the molecular weight of the medium and is 30 minutes for oil and 3 minutes for water.

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