Technical solution for supplying a solvent of asphalt-resin-paraffin deposits (AFS) to a tubing string of oil wells equipped with electric centrifugal pumps.

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Abstract: For prevention and combating paraffin deposits different chemical regents are widely used (inhibitors and AFS solvents). In field conditions many ways of chemical regents dosing are applied. Injection of chemical reagents in oilwell tubing is the most effective for ARPD solvents; in this case consumption of reagents is largely decreasing by comparison with chemical reagents dosing through the well-casing annulus. The article describes design and operating processes of technology of ARPD-solvent dosing in electric centrifugal well pumps installation. This process opens fluid access to oilwell tubing at higher pressure at the wellhead. Reagent RT-1-3, is used as aromatic ARPD solvent. In RT-1-3 there is butylbenzene fraction of Kazan Production Association Orgsintez containing a mixture of butylbenzene, isopropylbenzene and polyalkylbenzene.

1. Introduction

Every year the amount of new operational oil fields is being increased. The oils in these fields are marked with higher solidification point, viscosity and thixotropic properties. ARPD solvents appear inside oilwell tubings and decrease its throughput. At thickness 1 cm, pressure drop in oilwell tubing raises from 0.3 to 1 Mpa depending from its length [1 – 3].

To fight with paraffinization of well equipment different prevention and deposits termination methods are applied (also mechanical, thermal, chemical and combined methods). One of the ways of fighting with ARPD is using of solvents. This method is not universal and highly-effective because of necessity to match a solvent due to ARPD of the specific fields. [4 - 11].

2. Operating principle and description of technological automatic solvent feeder ARPD.

The construction of ECP is developed. The ECP opens access to water into oilwell tubing at increased pressure at the wellhead. Existing means [13-20] for pumping fluids into oilwell tubes from wellhead have some disadvantages, that do not allow to open check valve effectively.

Figure 1 illustrates the scheme of valve. The hull consists of an upper part and a lower part. In the body between lower (1) and higher (2) (not shown) there is thread connected stepped cylindrical
support (3) with gasket (4) in lower step and lock ring (5). In the lower part of upper support step (3)
there are radial drains (6). The upper support end part (3) is covered by a bowl (7), above which there
is a restrictor of its movement (8) with through-hole openings (9). The opening in upper end of support
(3) makes a landing hole for the bowl (7). Inside of cylindrical support (3) there is a hermetically
disposed water distributor (10) with through-hole radial drains (11), combined with radial drains (6) of
support (3). Drain (11) is combined with vertical drain (12), the lower end of which is constructed in
shape of saddle and covered by another bowl (13), and supported by spring (14). Bowl 13 with spring
14 are situated in body 15 with through-hole drains 16. In the body 15, in lower part there is a
regulating bolt 17 with movable plate 18.

![Figure 1 – valve scheme](image)

In the body of water-distributing streams (10) there are through-hole openings (19). Water-
distributing of streams (10) is held in inner chamber (3) by checknut (20) with screw threaded
connection.

The valve is installed in lower part of tubing string directly above submersible ESP (not shown in
Figure 1).

The operating principle of valve.

At the ordinary operating of submersible ESP the extracted production of reservoirs after coming
out of pump goes through the vertical drains (19) of water-distributor (10) and raising under the
influence of pressure the bowl (7), goes into tubing through the openings (9) (solid arrow on the
figure).

When deposits are generated in tubing or in operating details of submersible ESP, for ex.
inorganic salts or mechanic dashes with ARPD, there appears significant decreasing of its delivery. It
will be affected in information on reservoir gauging.
For sludge disposal well is being stopped by shutdown of ESP. After stopping the bowl (7) is placed in saddle under its own weight and blocks draining the liquid from tubing strings into the well through operating elements of the pump.

Then the calculated amount of solvent is injected into tubing string under overpressure. The solvent through radial drains (6,11) flows into valve and fixes a bowl (13) and creates a confined space in the pump without liquid circulation. In that way the dissolution of sediments with its following extraction happens.

Then the pump is launching. Well product lifts a bowl (7), goes into tubing string and flows on the surface into a system for gathering oil.

For securing the trouble-free operation of pump and effective disposal of draught the string 14 is fixed by screw 17 so that the bowl 13 overlaps its saddle at pump stopping. For solvent injecting into tubing string at the wellhead it is necessary to increase pressure up to estimated value, at which bowl 13 releases string 14 and starts flowing the liquid.

3. Conclusion

1. Solvent injection into tubing string effectively decreases consumption of reagents in comparison with solvent injection through the annular space of well.

2. Accumulating of impurities and deposits on filter and receiving part of the pump require ordinary pump washing with incoming fluid without chemical reagents.

3. Feasibility benefits of the valve are simplicity and reliability of valve opening, also an opportunity of sludge disposal from submersible equipment using less amounts of chemical reagents.

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