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(54) A method for reverse cementing of casing pipes

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Sample of Russian to English translation

Abstract. The offered method can be used for the reverse cementing of casing pipes. It provides an improvement in the effectiveness of cementing, reduces the time, improves the hydrodynamic regime and provides the possibility of controlling the cementing process. The essence of the invention is that, according to the method, an injection string with a tappet and a sealing element is lowered into the casing pipe. Then, an inverted valve of the casing pipe is opened by a tappet. The annular space of the injection string and its internal space are straddled. The first portion of a flushing fluid, a drill fluid and the second portion of the flushing fluid are [then] pumped in. The volume of all the fluids pumped in is equal to the volume of the internal space of the injection string. After this, a cement slurry is pumped in, and this pumping is realized according to a reverse scheme. The drill fluid is forced out through the injection string. The pumping of the cement slurry is stopped when the full volume of the first portion of the flushing fluid comes out onto the wellhead.

1 drawing. 1 claim.

The present invention relates to the mining industry, particularly to the construction of wells, and can be used in the process of cementing of casing pipe.

A method is known for the cementing of casing pipes according to which an inverted valve and a stop-ring are installed in a casing pipe; the free lower end of the well drilling tool is inserted in the aperture of the stop-ring. The gravitational force of the well drilling tool acts to open the inverted valve, which pumps in a special liquid, drill fluid in a volume equal to the volume of the casing pipe, and a cement slurry; when the signaling liquid is discharged onto the wellhead, the pumping of the cement slurry is stopped.

A method for cementing is known according to which a device is used for isolating the cementing of a casing pipe. A producing string is used to lower the device, and with the help of a sealing element it is unloaded onto the pressure nut of a casing pipe throttle non-return valve. The calculated volume of cement slurry is pumped in through the tubing string space of the producing string and it is pressurized by the drill fluid. Using a sphere dropped into the producing string, pins are cut off and circulation openings are opened, through which the excess cement slurry is washed away by the reverse circulation.

The disadvantages of this method are the use of direct filling, the complexity of the attachment operation connected with cutting off the pins due to the pressurization for opening the circulation apertures; contamination of the inside space of the casing pipe by the cement slurry, and the possibility of the cementing of the throttle non-return valve in the open state.

The object of the present invention is improved effectiveness by reducing the time of the cementing process, improving the hydrodynamic regime, and the possibility of controlling the cementing process.

The indicated object is achieved by equipping the inside of the casing pipe with a non-return valve and a “stop-ring”; into the aperture of the stop-ring is inserted the free lower end of an injection string that is equipped with a sealing element; the non-return valve opens and two volumes of the well are hermetically isolated; the first portion of the flushing liquid, the drill fluid and second portion of the flushing liquid are pumped into the annular space in a volume equal to the internal volume of the injection string; then the cement slurry is pumped in and the drill fluid is forced out through the injection string onto the surface (into a cleaning system). When the flushing liquid stops being discharged onto the surface, the process of cementing is complete; the injection string is [then] lifted, the non-return valve is closed, and the second portion of the flushing liquid and a portion of the cement slurry are washed out from the suspender.

In the drawing, a schematic view of an embodiment of the method for cementing of the casing pipe is shown.

Casing pipe 2 with “stop-ring” 3 mounted at the height of the cement column, and non-return valve 4 with rod 4^1 are lowered into a well. A free lower end of injection string 7 with sealer 6 is inserted into aperture 5 of the “stop-ring”; after that the first portion of flushing liquid 9, drill fluid 10, the second portion of flushing liquid 11, and cement slurry 12 are pumped into annular space 8. Drill fluid 13 is forced out onto the surface through circulating head 14 and pipeline 15.

Example. Well 1 is drilled to the depth of 1300 m using a drilling head with a length of 393.5 m, and [then] casing pipe 2 with a diameter of 324 mm is lowered therein. The the plan is to lower it to the bottomhole and to carry out cementing with a cement slurry that has a density of 1.75 g/cm^3. With the installation at the bottom, the casing pipe is equipped with "stop-ring" 3 at the mark of the height of the cement column, and with non-return valve 4 with rod 4^1. The valve 4 is placed under "stop-ring" 3, and rod 4^1 is a connecting mechanism for connection to the bottom of injection string 7 during the operation of valve 4. Casing pipe 2 is lowered to the bottomhole. After that, free lower end 6 of injection string 7 is lowered and inserted into aperture 5 of "stop-ring" 3, which hermetically isolates two volumes of the well. The gravitational force of injection string 7 acts upon rod 4^1 of non-return valve 4, which shifts downwards and opens. After that, the internal space of injection string 7 is connected with a cleaning system via circulating head 14 and pipeline 15. Then, the first portion of flushing liquid 9 in a volume of 3 m^3 is pumped into annular space 8, which is followed by the pumping in of drill fluid 13 and the second portion of flushing liquid 11, their overall volume being 13 m^3 (the volume of second portion of the flushing liquid is 1.5 m^3). Then, cement slurry 12 is pumped in, which is stopped after the total volume of the first portion of the flushing liquid 9 is discharged from pipe line 15. Injection string 7 is lifted up by 0.5 – 1 m (the non-return valve closes) and is washed for 1 – 2 h, after which the well is left to allow the cement to harden completely. The economic efficiency by implementing the offered method for the cementing of a casing pipe is due to improvement in the effectiveness of cementing because the time for the process is reduced, the quality [of the cementing] due to improvement in the hydrodynamic regime, and because the present method offers the possibility of controlling the cementing process.

Claim

A method for the cementing of a casing pipe comprising the lowering of an injection string with a tappet and a sealer, the opening of a non-return valve in the casing pipe, separation of the annular space of the injection string from its internal space, pumping of a cement slurry and the reverse circulation of the excess cement slurry from the injection string, wherein in order to increase the effectiveness of cementing due to a reduction in the time of the process, improvement of the hydrodynamic regime and the possibility to control the cementing process, the first portion of a flushing liquid is pumped in prior to the cement slurry, followed by pumping in the drill fluid, and finally pumping in the second portion of the flushing liquid, where the overall volume is equal to the volume of the internal space of the injection string, the pumping of the cement slurry is done by a reverse scheme with the drill fluid being forced out through the injection string, and the pumping of the cement slurry is stopped after the discharge of the total volume of the flushing liquid onto the wellhead.