FIELD APPLICATIONS™

Rocky Mountain Oilfield Testing Center

Bottomhole Kickoff Assembly

Prevents Cement Contamination in Kickoff Plugs

Product Developer: *Halliburton Energy Services, Inc.*

THE PROBLEM

Cement plugs for sidetracking wells are frequently set using the balanced plug method. This method requires the tubing or drill pipe to be set at the bottom of the plug. Cement is then pumped up around the pipe, and the pipe is withdrawn to the top of the plug and circulated clean. When the pipe is withdrawn through the soft cement plug, a channel forms which sucks the lighter fluid down into the slurry around the pipe. Because the cement density is usually much greater than the wellbore fluid density, gravity pulls the denser fluid down and causes the lighter fluid to rise through the plug. Such a "Rayleigh-Taylor" instability can contaminate the cement slurry, retard compressive strength, and compromise the ability of the plug to kickoff the sidetrack wellbore.

Balanced plug cementing practice has changed little in the past 20 years. Typically, two or three plugs must be set to obtain one of sufficient strength to initiate a successful sidetrack. Unless operators carefully follow best practices for plug setting, they rarely achieve first-time success setting a competent cement plug.

THE SOLUTION

Halliburton Energy Services, Inc. has developed a new bottomhole kickoff assembly that enables operators to set a competent cement plug on the first attempt.

The assembly contains a diverter tool that scours bore walls to remove mud filter cake as it is positioned in the hole. This hole cleaning allows a better bond between the cement plug and the formation. The assembly also contains an inflatable packer which separates the cement from the lighter mud and prevents gravitational instability. An optional aluminum or composite tailpipe above the packer stays in the hole after the packer is set to prevent contamination as the pipe is withdrawn through the slurry. Aluminum or composite tailpipe centralizers further enhance plug integrity. A release mechanism between the tailpipe and the drill pipe allows the assembly to detach cleanly at the top of the plug after cementing.

Halliburton and RMOTC tested the bottomhole kickoff assembly at the RMOTC field testing site (Naval Petroleum Reserve No. 3). These tests proved the ability of the tool to achieve a competent cement plug on the first attempt and a successful wellbore kickoff.

The Halliburton bottomhole kickoff assembly can save significant rig time by enabling operators to set competent cement kickoff plugs on the first attempt.

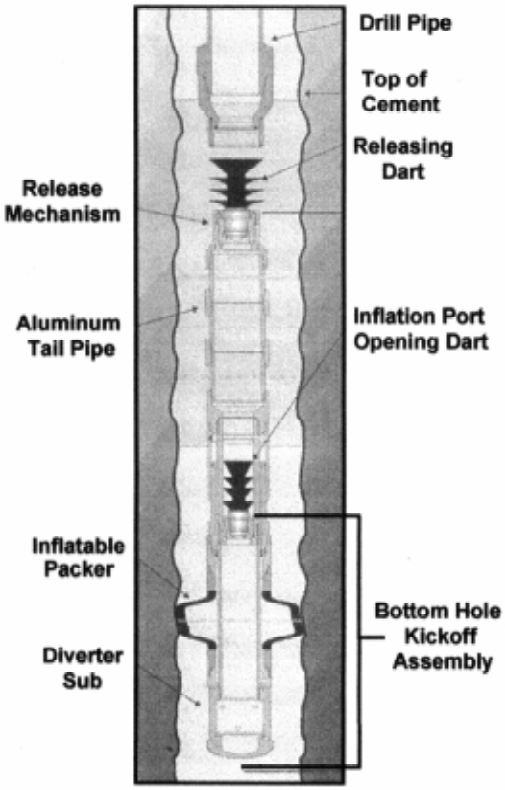
THE BENEFITS

An operator requiring a competent cement plug to initiate a kickoff, to isolate a high pressure water or gas influx, or to seal a lost circulation zone can save rig time by using the Halliburton bottomhole kickoff assembly to set the plug properly the first time.

The most useful application for the assembly is in high-cost drilling environments, where the rig time lost from a low compressive strength plug can be costly. In areas with lower rig costs, sidetracking requirements are usually fewer. Moreover, in low cost areas an operator can often set an additional plug for less than the cost of the kickoff assembly.

THE FIELD PERFORMANCE

The bottomhole kickoff assembly was tested on Well 72X10. The diverter sub, 5-1/2 inch packer assembly, aluminum tailpipe, rigid aluminum centralizers, and release sub were run in the hole on drill pipe to 4,915 ft. The hole was washed from the planned top of the plug at 4,462 ft to the setting depth. Next, a 17 ppg Class G cement slurry was mixed and pumped behind a 10 bbl spacer. A dart was then pumped to initiate packer inflation followed by the slurry for the plug and another dart to activate the release sub. The job was displaced with mud. The first dart hit the packer with 725 psi, then broke back as the packer inflated. When the packer was inflated, the pressure rose to 750 psi as the rupture disk broke and the cement began circulating up the annulus. Once the plug was in place, the last dart hit the release sub and pressure increased to 2,750 psi as the tool released. The drill pipe was released and picked up to reverse circulate the excess cement out of the wellbore.



The Halliburton bottomhole kickoff assembly contains a diverter tool that scours the bore walls to remove mud filter cake as it is positioned in the hole. The assembly also contains a drillable inflatable packer which separates the cement from the lighter mud and prevents gravitational instability.

Using the kickoff assembly, a competent cement plug was set on the first attempt. The well was then successfully deviated using this plug, a bit, a motor, and a bent sub assembly.

Though the assembly performed as designed, two operational problems resulted in changes in commercial operational procedures. First, hole problems required using a high percentage of lost circulation material. This material, in combination with the rubber and aluminum being drilled up with the plug, caused plugging of the bit, motor, and pump. An aluminum centralizer also slowed drilling for two hours during the kickoff, which demonstrated the advantage of using composite centralizers instead of drillable aluminum centralizers.

THE NEXT STEP

Since the RMOTC field tests of the bottomhole kickoff assembly were conducted, Halliburton has also developed a 9-inch kickoff assembly which can be used in 10-1/2 to 15-1/2 inch wellbores. The Halliburton bottomhole kickoff assembly is available worldwide through Halliburton Energy Services.

FOR MORE INFORMATION:

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