FIELD APPLICATIONS™

Single-Trip Casing Sidetrack System

Saves Time and Cost in Milling Casing Windows

Product Developer: *Smith Drilling & Completions*

THE PROBLEM

In the process of drilling oil and gas wells, often it is necessary to mill a window in the casing and sidetrack the existing wellbore to avoid a drilling problem (such as a stuck tool) or to enable directional drilling or multi-lateral completions. Sidetracking a well usually requires many trips with various bottomhole assemblies to mill a window that is sufficiently smooth and has the correct dimensions to pass drilling assemblies through. More trips cause greater rig costs, which can be significant in deep wells and in high-cost drilling environments such as offshore.

The industry has used numerous oriented sidetracking methods. The most common method involves setting a whipstock, running a starter mill, running a window mill, and then drilling a pilot hole in the formation with a mill above the bit to dress the window. The drill pipe must be tripped in and out of the hole for each step of this process.

Any successful window milling method must produce a gauge hole in the casing free of rough edges that may catch on drilling assemblies. It must also ensure that all milling equipment is retrieved after the window is cut. Any equipment left in the hole can create costly problems with any future work through the window.

THE SOLUTION

Smith Drilling & Completions has developed the Single-Trip Casing Sidetrack System, which enables a driller to set and orient the whipstock, detach the milling assembly, mill a full-size window, and drill a pilot hole all in a single trip. Unlike conventional sidetracking methods, this system does not require wedges or ramps to protect the whipface from the mills.

The Smith system contains several features that enable users to perform multiple functions without tripping for new bottomhole assemblies. A flow switch provides on/off flow control for MWD orientation, circulation, and anchor setting. The running tool is equipped to hydraulically set the integral packer and anchor. The milling tool is designed to perform three different milling functions. And the whipstock is designed with a multiple-ramp system to effectively guide the mill.

Smith Drilling & Completions and RMOTC tested the Single-Trip Casing Sidetrack System at the RMOTC field testing site (Naval Petroleum Reserve No. 3). The tests demonstrated the effectiveness of the system in milling a full-size casing window in a single trip.

Preparing to trip in the hole with the Smith Single-Trip Casing Sidetrack System at RMOTC. This system can greatly reduce the time and cost to sidetrack wells by orienting and cutting casing windows in a single trip.

Rocky Mountain Oilfield Testing Center

THE BENEFITS

In many drilling applications, the Single-Trip Casing Sidetrack System can provide several benefits over conventional methods of orienting and cutting casing windows.

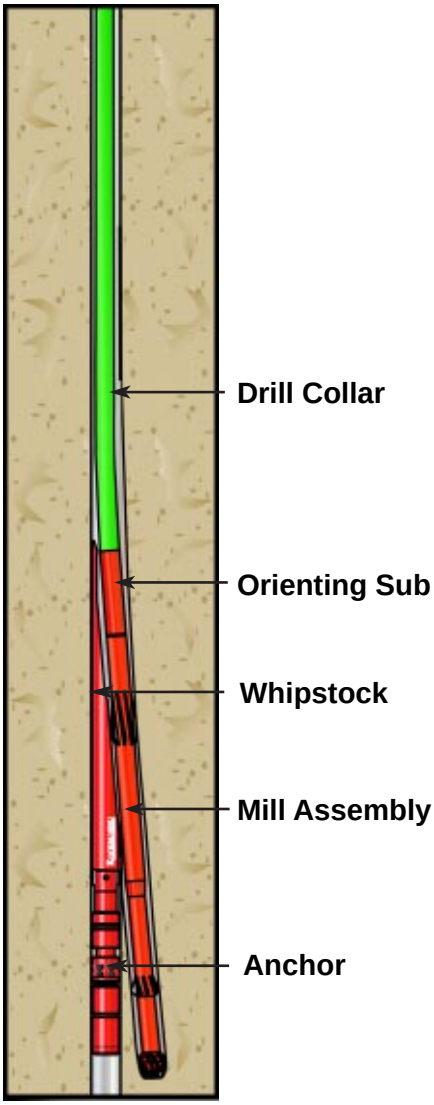
- Creates a full-size casing window for sidetracking and a full-size rat hole for the directional drilling assembly.
- Reduces rig time and cost because only one assembly is made-up and only one trip in the hole is required.
- Does not requires drilling out a wedge or ramp device during the milling operation.

The level of benefit gained with this system depends primarily on the depth of the well, number of trips required, and drilling rig cost.

THE FIELD PERFORMANCE

The RMOTC field test was designed to confirm the performance of the Single-Trip Casing Sidetrack System by cutting a casing window, running a directional drilling assembly, and then retrieving the whipstock.

The Single-Trip system, which included the multi-ramp whipstock, was made up and run into a well with 9-5/8 inch casing. The anchor was set at 729 ft., and then an 11 ft casing window was milled and an 11 ft pilot hole was drilled in 7-1/2 hours.



The components of the Single-Trip Casing Sidetrack System. The procedure for this system has 7 steps: 1) Run in hole, 2) Orient whipstock with MWD, 3) Set anchor, 4) Separate mill from whipstock, 5) Mill window, 6) Drill rat hole, and 7) Pull out of hole.

Milling began with a weight-on-bit of 3,000-4,000 lbs, a rotation of 90-100 RPM, and a circulation rate of 380 GPM. To mill past the center point of the casing, rotation was increased to 120 RPM and weight-on-bit was increased to 16,000 lbs. After completing the casing window, the multi-ramp whipstock and the anchor were conventionally retrieved from the hole.

A downhole video camera was then run through the casing to record the profile of the casing window. The video confirmed that the window had been successfully cut.

The mills used to cut the window showed measured wear of 5/16 inch under gauge. To verify the size and utility of the window, two drilling assemblies were made up and run into the hole. The assemblies consisted of an 8-1/2 inch bit on a full gage integral blade stabilizer made up to 6 inch drill collars. These stiff assemblies passed through the window and reached the bottom of the pilot hole.

THE NEXT STEP

The Smith system, called the Trackmaster™, is used commercially worldwide. The system is available through Smith Drilling & Completions. Smith is currently developing tools for cutting windows in casing sizes other than 9-5/8 inch.

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For more technical information on this project and to learn how RMOTC can benefit you, visit our Web site at WWW.RMOTC.COM

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