

HOLE IN ONE

A close-up photograph of a golf club head, specifically a driver, resting on a green grassy surface. A white golf ball is positioned on a yellow tee, sitting directly in front of the club's face. The background is a blurred green field, suggesting a golf course setting. The large, white, stylized text "HOLE IN ONE" is overlaid on the top half of the image.

Weekam Yap, Halliburton, USA, analyses the development of a new single-trip solution which combines upper and lower completion systems.

To help operators meet the ever-increasing challenges and requirements of deepwater and ultra-deepwater operations, a new single-trip system has been designed to facilitate the installation of both upper and lower completions in just one trip, with remote activation of downhole components. The high cost of deepwater and

ultra-deepwater operations makes the economic viability of developing these assets a challenge for operators, and the industry must always look for ways to reduce the cost per barrel of hydrocarbons produced. One way to achieve this is to reduce the number of trips needed to complete a well. Conventional well completion typically requires multiple trips to install the lower sand face completion, in some cases an intermediate completion and finally the upper completion. Additional time is required if the well needs to be gravel packed.

Halliburton devised the True Single-Trip™ system with the intention for the lower completion assembly to be run on the same trip as the upper production assembly, including the production packer, downhole gauges,

safety valve, and other completion accessories – effectively replacing conventional systems, where upper and lower completions are installed in multiple trips.

The new system combines proven completion tools and technologies in a variety of configurations to ensure reliability, reduce rig time, decrease costs, and mitigate risks by decreasing the number of completion trips. By decreasing rig time, the amount of personnel exposure to potential hazards can be reduced as well as health, safety, and environmental (HSE) concerns.

In deepwater environments, the system provides days of time savings compared to conventional multiple-trip completions. Multiple options are available for this system, from premium, complex interventionless designs to simple completion designs. The system features design flexibility with multiple screen and barrier configurations to fit the variety of challenges presented by the operators' wells. The interventionless option does not require any ancillary equipment for component activation, and provides pressure test capabilities during installation.

The system allows operators to make up both the lower sandface completion (including screens and inflow control as needed) and the upper completion, and then to run the entire string to total depth.

Screen options

The advancement of remotely opened/activated screens allow them to be run in the closed position, eliminating the need to run washpipes and make it possible to install the upper and lower completion in a single trip. The various screen options are screen with inflow control device (ICD) modules with dissolving or mechanical plugs and a remote pressure activated compliant screen (Endurance Hydraulic Screen [EHS]). The ICD modules can be run with or without the ICD nozzles. If run with ICD nozzles, it works to delay the flow of unwanted fluids into the horizontal wellbore, thus allowing operators to increase recoverable reserves, extend well production, and reduce the cost and risk of handling unwanted fluid at the surface.

Alternatively, when the system is installed with compliant screen technology it removes the annular gap between the screen and the openhole upon hydraulic activation – mitigating the effect of sand production on productivity and on downhole equipment.

Furthermore, the compliant screen system helps ensure reliable performance throughout the life of the well. It can replace standalone screen completions, traditional gravel packs, and expandable sand screen technologies because it provides positive compliant sand control and strong wellbore support in a single-trip installation.

The system complements zonal isolation and multizone completions, and can be deployed through multilaterals for enhanced reservoir contact.

Packer technology

The hydrostatic set, cut-to-release, retrievable packer is a production packer run integral to the production tubing to provide reservoir isolation in the casing annulus, along with production tubing anchoring capabilities. It can be installed in a single trip, and set with available well hydrostatic pressure.

Isolation packers deliver consistent sealing performance in a range of openhole and cased-hole conditions. They have been designed to

meet the challenges and requirements of deepwater, unconventional, and mature field locations. Alternatively, the Swellpacker zonal isolation system will swell to expand and seal the annulus around the pipe either in an openhole or cased-hole application. It has no moving parts and requires no downhole or surface activation.

Sleeve and valve technology

The remotely activated circulation valve provides the capability to circulate above the packer at high rates without intervention. The options are a HS circulation valve or the hydraulically activated Sliding Side-Door® sleeve (HASSD). The sleeve opens via a single pressure cycle, and opening occurs after the bleed-off cycle. The large flow area through the ports is equal to or greater than the flow area through the bore of the sleeve allowing full-bore flow circulation.

The HS circulating valve is designed for use in SmartWell® and conventional completion systems, for safe and efficient circulation of completion fluids after landing the completion or setting a packer. It is a bidirectional, hydraulically operated balanced piston valve with a gas-tight redundant sealing mechanism. The sealing mechanism consists of a debris-tolerant metal-to-metal (MTM) primary seal and a secondary thermoplastic seal array.

Furthermore, a remotely operated downhole eMotion control unit can be permanently deployed as part of the tubing, in order to remotely open and close a slave valve, such as a sliding sleeve or ball valve. Each time the slave valve is operated in this way, an intervention is eliminated from the operation – reducing rig time, costs, and associated risks.

One valve controlled by the unit is the LV ball valve, which is an isolation barrier valve. It can be repeatedly opened or closed by remote command and is permanently deployed as part of the tubing, where it is used as a full-bore testable barrier and also for setting packers during completion deployments. It can be actuated without intervention or surface control lines, saving tubing hanger penetrations.

Similarly, the HS circulating valve is a gas-tight (ISO V0-rated) circulating valve that can be repeatedly opened or closed by remote command. Permanently deployed above the production packer as part of the tubing string, this valve is used to swap out the annular fluid above the packer, controlling the flow of well fluids between the tubing and annulus without the need for interventions or surface control lines.

Deployed below a lock or bridge plug, eRED ball valves can be remotely opened or closed. Used as a downhole barrier, they can be used to remove multiple interventions from a well operation. Its application in the Single-Trip System is to allow washdown to get the assembly to bottom, circulation of filter cake breaker fluid, activation of the compliant screen and the screen with mechanical plug module, setting of openhole packers and to permanently isolate the shoe during production.

Gauging technology

The Opsis gauge has been designed in order to perform with greater reliability in high pressure high temperature (HPHT) environments. Part of the DataSphere permanent monitoring suite, the quartz-based gauge features advanced application-specific integrated chip (ASIC) technology and the dual MTM, pressure-testable connections with proven reliability for the family of gauges. The technology is rated up to 200 °C (392 °F), while the gauge itself has demonstrated reliability for up to 10 years at 185 °C (365 °F).

Conclusion

Combining proven reliable technologies into a single-trip system allows operators to streamline their completions – often cutting completion time in half, compared to conventional multiple-trip completions in deepwater environments. The new system, which is designed to achieve both upper and lower completions in a single trip, enables operators to optimise their completions and, ultimately, maximise well performance. ■



Figure 1. *The Single-Trip System.*