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New Liner-Hanger Technology Improves Safety and Reduces Non-Productive Time in Deviated High-Temperature Wells in South Central Venezuela

Cesar Jimenez, Simon Soto, and Andrehny Leon, Petroleos de Venezuela, S.A. (PDVSA), and Pedro Marval, and Martin Schoener-Scott, Halliburton

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Abstract

In deep drilling operations, liners hangers are used to eliminate the need to run full strings of casing. Unlike regular casings that are installed back to surface and will be terminated downhole at a hang-off point in the last casing. Depending on the wellbore conditions, deploying liner hangers can be very difficult, and in many scenarios, the bottomhole assembly (BHA) must be rotated and/or reciprocated in order to set the BHA at the target depth. Unfortunately, conventional liner-hanger systems often do not permit tool rotation due to the complex design. Liner-hanger deployment failures can cause loss of the wellbore or a section of the wellbore, which in turn, will result in additional well construction costs to sidetrack and drill another section through the production zone.

An expandable liner hanger that has a less complicated design that withstands aggressive reaming as well as drilling to depth is now available. This expandable system has no external moving parts such as slips, hydraulic-setting cylinders or separate liner-top packers, which are used in conventional liners. These attributes help mitigate the risks associated with the deployment exercise and complexity of the completion.

PDVSA embraced this technology to help them optimize operations in their deep wells in which extreme environments, often close to 300°F, with deviations greater than 60 degrees and setting depths of more than 12,000 feet are encountered.

The benefits that have been gained by adopting this technology are:

- Optimized capital expenditure
- Optimized rig-time efficiency (reduced NPT)
- Avoidance of costly trips to mitigate hanger damage, and premature setting
- Elimination of external moving parts on the hanger assembly (reduced complexity)
- Reduced rig time
- Improved reliability and fluid flow
- Elimination of slip damage to supporting casing

Three case histories that compare the traditional and expandable liner hanger systems and verify the advantages stated above will be presented in the paper.

Introduction

The discussion in this paper concerns three wells that are located in the state of Barinas and Apure in Southern Venezuela (**Figure 1**). Using expandable liner hangers in Barinas and Apure have provided two very important functions in the well construction process. The first function concerned support of the liner weight, and the second function was the provision of a positive seal on setting that would isolate pressure differentials between the wellbore section above the liner hanger and the wellbore section below the liner hanger.

A common problem in the industry concerns the fact that failure of conventional liner hangers normally occurs during the deployment of the liner or during the setting process, and the failures can be due to a variety of reasons:

- Lack of cement integrity at the liner top
- Premature setting of the liner hanger
- Inability to reach target depth
- Problems with conventional tools (darts, plugs, setting tools, etc.).