

SPE130427 Development Qualification of a New Wireless Controlled Retrofit Safety Valve

Abstract

There are many examples of wells around the world today that are shut in because of failure of surface-controlled subsurface safety valves (SCSSVs). While these valves are generally very reliable, the control line that runs to the surface in the annulus is susceptible to plugging by contaminants in the hydraulic control fluid and also to corrosion, which causes leaks; both are outcomes that render the valve inoperable. The failure of the control line also means that the contingency solution of installing a wireline-retrievable surface-controlled subsurface safety valve (WR-SCSSV) is not possible.

When a safety valve fails, the most common remedial solution today involves installing a subsurface-controlled safety valve (SSCSV), such as an ambient valve or storm choke. While this solution is lower cost and more straightforward than performing a full rig-based well workover, it is not as safe. SSCSVs are directly influenced by changing well-flow conditions, such as high flow rates and low pressures, or by water slugs, and thus are notoriously unpredictable in operation. Additionally, they are not controllable from surface and not fail-safe, which is undesirable from a well-control and safety standpoint.

By transmitting electromagnetic (EM) signals from surface to downhole, it is possible to control downhole hardware. A wirelessly controlled safety valve has been developed that can be retrofitted into a well using conventional slickline intervention equipment and procedures. Being controllable from surface and of a fail-safe closed design, this valve offers both functional and safety advantages over existing SSCSV solutions. This new valve also offers a retrofittable solution for wells having no hydraulic control line installed. In situations where a capillary string may need to be installed for foam- or chemical-injection purposes, it also provides an opportunity to free up the hydraulic control line.

A prototype valve was subjected to qualification and functionality testing in accordance with a modified International Organization for Standardization (ISO) 10432 test procedure. This testing was followed by installation in an onshore gas well for a 6-month trial that involved both flowing and injection phases. The valve was cycled and inflow-tested regularly and performed reliably, consistently, and fully in accordance with specification throughout the trial period.

This successful trial of a new wirelessly controlled safety valve marks the introduction of a more-controllable and -predictable alternative to an ambient valve or storm choke, minimizes deferred production, and increases the well's safety. Following the successful onshore trial, the valve is now considered ready for wide-scale field application onshore, and at the time of writing this paper, plans for performing a first trial on an offshore platform are well advanced.