Being involved with every stage in multistage well completions is one of the most important advantages an engineer can have in the process. Plug and perf (PNP) techniques enable engineers to analyze and adjust each stage of the process, applying changes and knowledge gained to optimize operations. The first stage of the PNP method, however, can be time-consuming and can require mechanical intervention such as coiled tubing (CT), stickpipe, or a downhole tractor to ensure perforation. Unfortunately, this means the operation could suffer loss of productive time and a spike in operational expenses.

Schlumberger has taken this common issue in PNP operations and provided a solution for operators in its aptly named KickStart pressure-activated rupture disc valve. This tool is used in the first stage of a PNP operation, allowing fracture stimulation without the need for an intervention to perforate the casing, the company said. The valve is run in-hole with the production casing and is spaced in the string such that it aligns with the first stage target formation when the casing is landed and cemented in place. This gives operators the ability to test the casing integrity prior to the fracturing treatment operation so that casing operations can continue without interruption.

Rock formations fracture when their weakest point aligns with maximum stress. The KickStart tool targets that stress point by exposing the formation outside the casing to fracture pressure, making sure that the fracture aligns with the maximum horizontal stress plane. This reduces the probability of a premature screenout of the initial fracture treatment by reducing tortuosity at the fracture initiation point. It accomplishes this after the pumps are activated. Pressure begins building up in the casing until one of two rupture disks breaks at a predetermined pressure. Once the disks break, a sliding sleeve in the tool opens a port exposing almost 360° of the formation.

After this event pumping continues as normal, and a fracture is initiated at the formation’s weakest point. Once the fracture has propagated to its designed height and half-length, PNP operations are initiated for subsequent stages.

In the Eagle Ford shale, where PNP operations are a favorite of operators in more than 75% of 4,000 wells in the area, the KickStart tool offers an advantage for engineers looking to facilitate the process, according to the company. To avoid the use of CT or a wireline tractor when attempting to perforate the bottom stage, this technology was used to complete 14 wells in the area. By eliminating mechanical intervention, it was estimated by the company that approximately US $105,000 per well was saved when perforating the first stage of horizontal Eagle Ford wells. The valve successfully handled large fracture stages of 250,000 lbm of proppant pumped at 65 bbl/min, Schlumberger said. The technology has been implemented in more than 300 wells worldwide.

Cabot has used the pressure-activated rupture disc valve to complete 14 wells in the Eagle Ford shale. The company has saved nearly $1.5 million, or approximately $105,000 per well, by eliminating the need for CT intervention to perforate the first stage of its horizontal Eagle Ford wells. (Image courtesy of Schlumberger)