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## **Completion System Allows for Interventionless Stimulation Treatments in Horizontal Wells with Multiple Shale Pay Zones**

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### **Abstract**

This paper will discuss case studies and details of a pinpoint stimulation/completion process that uses stimulation sleeve technologies in conjunction with swelling packers as part of an openhole, horizontal, well lateral liner that is anchored by an expandable liner hanger. This system will allow an operator to accurately place several individual stimulation treatments without additional intervention in the wellbore. This is accomplished by installing the closed stimulation sleeves and swellable packers as part of the completion string, (horizontal openhole liner) and positioning the string in the wellbore so that the stimulation sleeves are located within the desired production pay zones. The completion string is then anchored in position with an expandable liner hanger. The swellable packers are allowed to expand for a few days and isolate the zones between each of the sliding sleeves. Stimulation/frac equipment is rigged up, and a series of progressively larger balls are dropped throughout the multistage pumping operation. The balls land on the tapered baffles in the sleeves, each of them opening in sequence and sealing off the previously treated zones below. Once opened, a stimulation sleeve allows pumping a treatment into the zone where it is positioned. After being opened, the stimulation sleeves maintain the capability to be closed and reopened, with minor intervention, with a shifting tool allowing for restimulation or other workover at a later date.

This new service is a field-proven process with 120 wells completed and more than 850 stages/zones treated. This method reduces the time and cost needed to complete multiple intervals in a well, and bring production on line faster by comparison to conventional multizone horizontal fracturing/stimulation techniques such as multiple perforating and setting plugs.

### **Introduction**

Multizone wells can pose completion challenges for operators. One challenge—isolating and fracture-stimulating multiple pay zones during the well completion process—is especially demanding when working with cemented production casing strings, openhole completions, or openhole packers and perforated liners.

In a conventional completion/stimulation process, the cemented casing string is perforated in the toe and stimulation begins. Sequential steps in this completion process require the operator to set plugs, perforate, and fracture each zone individually. Depending on the well design and fracture-treatment design requirements, several hours per zone may be required for the plug and TCP/wireline trips that prepare each stimulation stage, leaving the fracturing crew idle. Continued innovation has made this process somewhat more efficient in horizontal applications by use of pumpdown composite plugs, but, at its best, operators can still only perform three or possibly four fracture stages per day on a single well. With the increased activity of today's industry, scheduling equipment and manpower for future fracture dates is becoming more difficult and could result in delays in production when multiple fracture treatments are desired.

When using an openhole completion technique, the operator drills into the formation and opens a path to the wellbore for production. This works well in formations that have structural stability and contain natural fractures. However, problems arise when stimulation treatments are desired because 'bullhead' fracturing treatments usually result in fracturing the weakest point in the formation without treating the entire pay zone. This complication prevents operators from achieving the maximum potential payout on their investment, and can result in additional expenses for interventions associated with re-stimulating to increase production to make the well commercially viable.

In wells that are in areas with high concentrations of natural fractures, cementing a production string in place is not a preferable option because cement may migrate into the natural paths that allow hydrocarbons to enter the well, resulting in production losses. The situation gets even more complicated when the wellbore crosses sensitive areas such as water zones that must be isolated from wellbore treatments. In this scenario, operators might choose to run openhole packers in the