

## Tartan Cemented MultiFrac Limited Entry Ball-Drop Systems Increase Production by 12.5% in the Utica

### OBJECTIVE

A major operator exploiting the Utica shale formation wanted to maximize stimulated rock volume on their most extended reach horizontal wells. They were looking for a cemented completion solution that would enable more frac stages while simultaneously increasing limited entry cluster efficiency. They were using cemented plug-and-perf completions, but wanted to take advantage of the more time-efficient operation of ball-drop sleeves, while maintaining cemented liner stage isolation.

### SOLUTION

Tartan proposed a solution that allowed the operator to increase their stage density while optimizing cluster efficiency. The patented MultiFrac™ sleeve enables simultaneous stimulation of multiple stages with one actuation ball. The integrated patent-pending BurstPoint™ port technology increases cluster efficiency from 55% to 95% by preventing proppant erosion during the fracturing treatment – translating to increased production.

The BurstPoint ports are machined such that they explosively open at a known threshold pressure and are sized to match the limited entry design (Fig. 1). Until the point of fracture initiation, the BurstPoint ports remain totally closed preventing cement from entering the system, enabling reliable ball-drop operations.

### RESULTS

The operator chose to complete 4 wells, 2 wells on each of two separate pads with hybrid cemented systems using Tartan’s MultiFrac for 18 treatment stages at the toe comprising 5 MultiFrac sleeves (clusters) for a total of 90 sleeves – the most cemented ball-drop sleeves ever run – and a further 16 plug-and-perf stages at the heel.

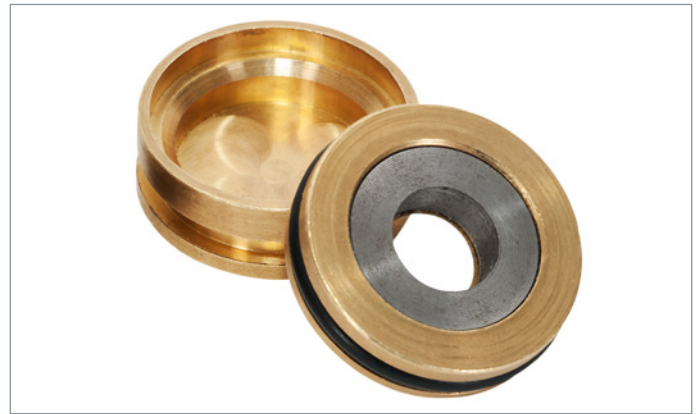


Fig. 1—BurstPoint port inserts are made from hardened steel inserts and machined to match the designed fracturing rate.

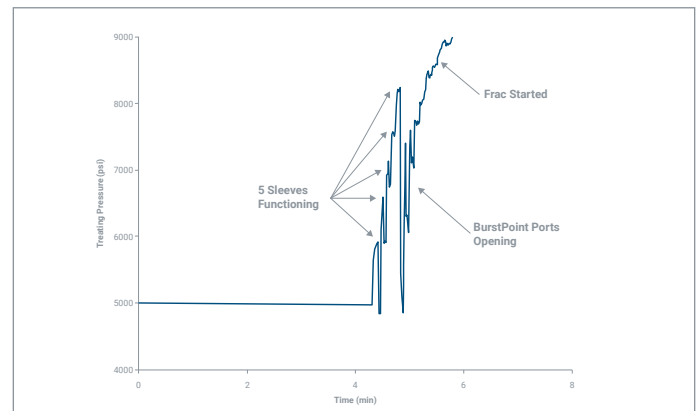


Fig. 2—Detailed view of pressure plot showing positive shifting signatures for 5 MultiFrac sleeves and opening of BurstPoint ports in one stage.

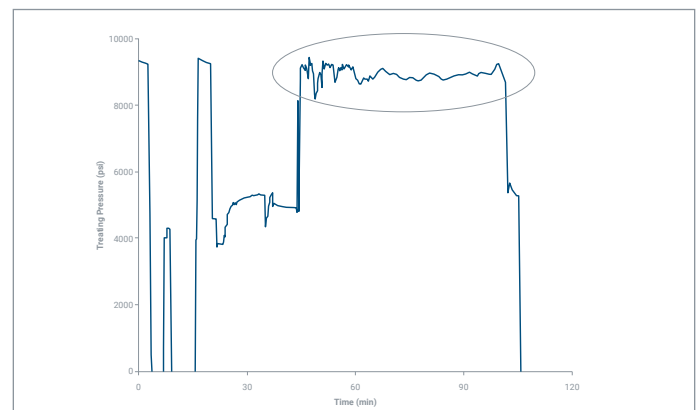


Fig. 3—Pressure chart proving that BurstPoint ports do not erode, enabling frac pressure to be maintained throughout the treatment stage.

All 360 MultiFrac sleeves successfully functioned with clear pressure signatures for sleeve shifting and opening of the BurstPoint ports (Fig. 2). On average, each stage was pumped at 80 bbl/min with 5,100 bbl of fluid and 330,000 lb of proppant for a total of 5.6 million lb per well (see job summary). On average, the 18 MultiFrac treatment stages were stimulated in 1.5 days compared to 3 days for the 16 stages of plug-and-perf.

In addition, calculated limited entry back pressure is maintained throughout the stage treatment with BurstPoint ports (Fig. 3) compared with plug-and-perf (Fig. 4) because they are not affected by proppant erosion.

Reviewing production between two wells completed with the MultiFrac system on 18 of the 34 stages versus two wells on the same pad with 34 stages of plug-and-perf for the first 180 days showed a 12.5% increase for the well completed with MultiFrac systems (Fig. 5). If MultiFrac sleeves were used on all treatment stages, by extrapolation this increase would have been 23.7%.

Job Summary		
Formation	Utica	
Stages	Total = 34 MultiFrac = 18 x 5 sleeves Plug-and-perf = 16	
Liner	5.5 in. (139.7 mm) 20 lb/ft (29.76 kg/m) P-110 premium threads	
	PAD 1	PAD 2
Avg. MD ft (m)	16,100 (4,910)	18,680 (5,690)
Avg. TVD ft (m)	8,110 (2,470)	8,025 (2,450)
Avg. Lateral Length ft (m)	7,560 (2,300)	8,690 (2,650)
Avg. Total Proppant lb (kg)	5.6 MM (2.54 MM)	
Avg. Proppant/Stage lb (kg)	330,000 (149,700)	
Avg. Frac Fluid/Stage bbl (m <sup>3</sup> )	5,100 (810)	
Avg. Frac Rate bpm (m <sup>3</sup> /min)	80 (12.7)	
Avg. Frac Pressure psi (MPa)	8,400 (58)	

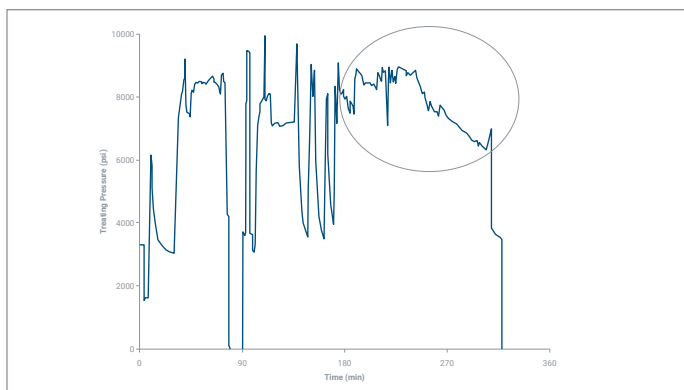


Fig. 4—Pressure chart showing plug-and-perf erosion reducing limited entry stimulation efficiency.

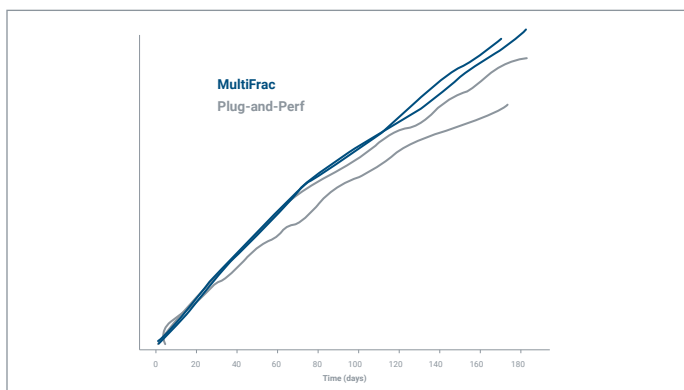


Fig. 5—Oil production from Utica wells completed with hybrid MultiFrac systems versus plug-and-perf. Data was normalized to lateral length.

## ABOUT TARTAN COMPLETIONS

Tartan Completions is a multifaceted energy services company that engineers and manufactures innovative, customized multistage stimulation solutions and provides completions milling services globally. For over 20 years, Tartan has followed the philosophy of engineering our products with simplicity, reliability, flexibility and performance in mind, providing outstanding field service and value to our customers. From design to installation, we continue to meet the high expectations of our customers.

Please contact Tartan Completions for any of your downhole completion system and milling requirements.

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