

# BUILDING DATA SUPERHIGHWAYS

**John O'Hara and Andrew Penno, Halliburton**, explore the emergence of intelligent completions technology.

The oil and gas industry remains a cornerstone of the world's economy and continues to adjust and adapt to market conditions. Extraordinary changes this past year have forced the oil and gas industry to shift from relying on mobile operational support and central technology development to a remote model focused on a solid in-country infrastructure and digital communications to support ongoing operations. These significant challenges – the substantial decrease in oil and gas demand caused by COVID-19, focused efforts to reduce carbon footprints, organisational and operational downsizing and asset rationalisation – heightened demand for collaboration between Halliburton and E&P operators.

Halliburton Completion Tools has designed The Future of Completions™, an embodiment of solutions that will introduce an end-to-end digital ecosystem, advances in new materials, innovations with increased autonomous reservoir controls and all-electric completion systems.

## Collaboration

The company collaborates with customers to clearly understand their value drivers in areas ranging from wellbore equipment design to digital reservoir management. Halliburton Completion Tools comprises a technical structure of advisors and subject matter experts to facilitate the continued remote support of global operations. A global network of operational bases (with extensive local expertise) provides in-country support and maintains a strong global technical support organisation. This structure has been instrumental in responding in a timely manner to shifts in operational needs during global travel restrictions. The shift to a more diverse global technology pool, coupled with greater focus on in-country resources and new digital processes, has enabled continuity in delivery of services.

## Purposed technologies

Unexpected disruptions to global operations, as well as a competitive low-price environment, have amplified the need to provide operators with purposed technologies that deliver the lowest cost per barrel of oil equivalent (boe). Completions technologies, such as the DataSphere® permanent monitoring suite of sensors, help optimise reservoir treatments and production efficiency. The Enhanced Single-Trip Multizone

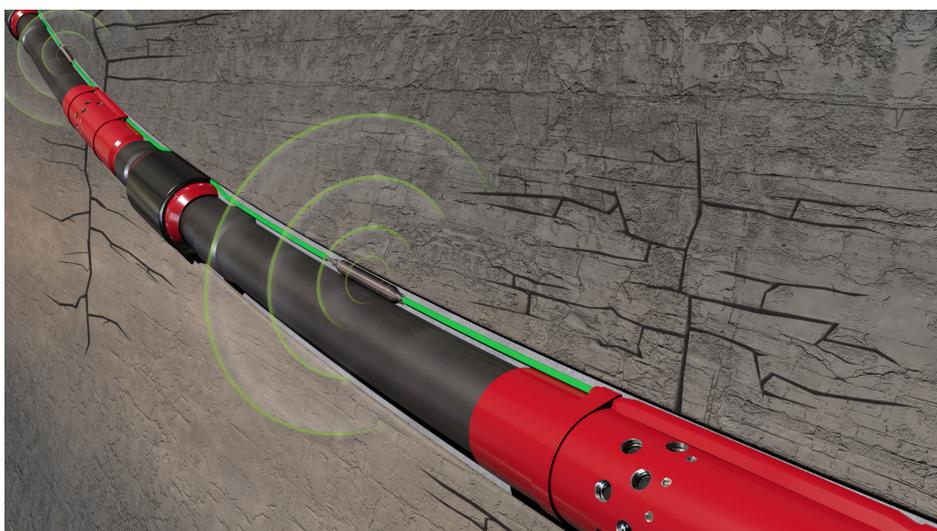
Completion System (ESTMZ™) delivers capital efficiency during drilling and completion operations. The system is part of the advanced completions suite of solutions, which comprise a broader capability and include advanced lower completions, intelligent completions and multilateral completion solutions. The application of such technologies is the linchpin of how purposed technologies are implemented to provide value to operators across global basins.

By way of example, in the Gulf of Mexico more than 30 ESTMZ systems have been deployed and reduced the completion duration by 18 days per well. This helped the operator save US\$12 million and reduce the CO<sub>2</sub> footprint by more than 800 t per completion. Additionally, Halliburton has released and deployed the Xtreme Single-Trip Multizone Completion System (XSTMZ™). This second generation of the system enables realisation of further cost and emission reductions in deeper frontier completions. For another operator in Indonesia, SmartWell® completion systems were integrated with the ESTMZ system, which helped reduce CAPEX and CO<sub>2</sub> emissions during the completion phase. Full zonal control continued to be provided during the life of the well, increasing asset value by managing production of each individual producing zone.<sup>1</sup>

In Norway, a 20-year collaboration in the advancement and

development of purposed technology has helped operators maximise ultimate hydrocarbon recovery and reduce surface footprint. The company has implemented intelligent completions, multilateral technology (MLT) and passive flow control devices such as inflow control devices (ICDs) and autonomous inflow control devices (AICDs). Of these technologies, MLT systems integrating SmartWell systems have delivered a significant impact for operators. The modification and development of MLT junctions culminated with the current FlexRite® Multibranch Inflow Control (MIC) System, which allows for three and four lateral leg designs that incorporate SmartWell system production control at each lateral leg.<sup>2</sup> The successful deployment of these systems in new and existing wells in several Norway fields has led to adoption across large growth markets, including the Middle East, Eastern Russia and Asia-Pacific.

Sensors continue to be value drivers in the advanced completions space. Encompassing advanced downhole pressure, temperature, flow and density sensing technology, the DataSphere permanent monitoring suite is designed for versatility and modularity, providing operators with customised solutions to help increase reservoir contact and hydrocarbon recovery for the life of the well. In unconventional basins across North America and Argentina, the monitoring suite provides distributed pressure sensors for reservoir and advanced fracture interference insights.



**Figure 1.** The DataSphere permanent monitoring suite is modular and versatile, helping to optimise production and validate reservoir models.



**Figure 2.** Multilateral systems with three and four lateral leg designs enable individual production control.

Critical insights are received during both the completion phase to help quickly identify fracture interference and the production phase to understand production forecasting, artificial lift performance and depletion.<sup>3</sup> An equally rapid adoption is behind-casing monitoring utilising casing inductive coupling technology. In Norway and the Caspian Sea, the DataSphere LinX<sup>®</sup> system leverages wireless through-casing data and power transmission to allow for behind-casing monitoring. This provides real-time life-of-well pressure and temperature insights, monitoring caprock integrity on injectors, as well as pressure in the B and C-Annulus. The technology optimises and helps remove the need for observation wells.<sup>4</sup>

## Digital capabilities

Purposed technology will be complemented by the company's transition into the digital oilfield. Halliburton Completion Tools has created eCompletions™; a digital ecosystem that advances completions by improving service quality, accelerating continuous improvement and leveraging autonomous capabilities that will exponentially improve how customers manage their reservoirs. Integral to the the company's 4.0 digital oilfield strategy, the eCompletions system comprises multiple platforms – business development, operations, manufacturing, technology and Clariti™ digital reservoir management – interconnected to share data seamlessly and deliver real-time solutions from ideation through to reservoir management. The customer-facing platform consists of five applications: Clariti View provides remote well data visualisation and parameter alarm setting while Clariti Flow delivers zonal flow allocation with fluid fractions. Clariti React, Manage and Predict

will provide full asset and production optimisation by leveraging the company's petro-technical capabilities with the functionality provided by the SmartWell completion systems.

## Data superhighways

The company is rapidly moving towards further digital integration and expanding connectivity and communication across its intelligent completions technologies. The symbiotic relationship between sensor and telemetry technologies provides a focus for a multitude of solutions. In a forward-looking form, this combination creates the potential to fully automate the controls and management of reservoirs across wells, fields and entire assets. This focused application of advancements in downhole technologies will provide the capability of turning wells into data superhighways. These superhighways will allow operators greater access to information and control of their reservoirs, all connected back and tied into broader digital oilfield capabilities. ■

## References

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