



IN THE FIELD: Dustin Young, Halliburton's global technical advisor for unconventional.

Images: Halliburton

Global prospects

Halliburton's Dustin Young sees a future for international shale gas developments. But conditions above ground and below will set them apart from their North American counterparts, writes **Jennifer Pallanich**.

A variety of factors paved the way for the explosive growth of unconventional oil and gas production in North America. Favourable regulations. A competitive landscape with goods and services widely available. Positive public perception. Robust logistics infrastructure.

Internationally, however, shale development has not seen quite the same uptake. International shale projects face a tougher regulatory environment, a lack of existing infrastructure, poor public perception, and a higher cost

of goods and services. "There's been a rapid growth curve for shale gas development over past decade, fuelled by favourable conditions in North America," says Dustin Young, Halliburton's global technical advisor for unconventional. "The economic framework we have to work in for shale gas developments internationally is a completely different scenario."

To work in international shale plays requires a different approach than North America for another fundamental reason — the rocks.

"Analogues are good, but we have come to understand that all the

rocks are different, and no two shales are the same," he says. "International shale plays are often hybrids (of source rocks and tight reservoirs) rather than true shale."

As such, well architecture and completions may vary wildly from best practices in North America.

"You could be looking at vertical and deviated wells instead of horizontals" with multiple stages, he says.

Because of the difference in rocks, data acquisition is vital as a prelude to devising appropriate technical solutions.

"No two shales are the same,"

Young says. Each reservoir has its own properties, sometimes varying foot by foot. "All the rocks are different. There are hybrid formations that behave completely differently from shale formations. Small differences in rock play a large role in how a well will ultimately produce."

With that understanding in mind, gathering data with logging tools can reduce uncertainty about a well's productivity potential. Rock properties include porosity, permeability, total organic carbon, brittleness, Poisson's ratio, Young's modulus of rock mass, and the stress regime

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KEEPING A CLOSE EYE: A Halliburton engineer monitors a hydraulic fracturing operation in west Texas.

» of the rock. Knowing these properties helps identify which areas of the reservoir will respond most favourably to fracking. All of these factors together help engineers home in on the sweet spots.

“We’ve come to learn that it’s not just possible to frack into the good section in the rock, but the well needs to be placed into those sections specifically,” he says. “Then a stimulation treatment can be designed for those reservoir properties.”

In early 2016, Young was involved in an unconventional project in the Middle East. One vertical pilot well indicated the asset had gas, gas condensate and oil, but there was a lot of uncertainty about the reservoir because of a lack of data. Investors were pressuring the operator to prove there were producible hydrocarbons in place.

“From the vertical well we didn’t have a good idea of the pressure across the reservoir or an understanding of the stress regime. If we tried to design a well with this data, there was a high probability we wouldn’t drill in the right

place to maximise efficiency of the stimulation, leading to an underperforming well,” Young says.

The decision was to drill a second vertical well and acquire additional data for use in planning a horizontal production well with multiple frack stages. The second well clarified the reservoir’s pressure, permeability and stress regime and led to a “much higher level of confidence in recommending the horizontal well trajectory and multistage stimulation program,” he says. “Data acquisition in the early stages of field development can play a critical role.”

That said, he cautions that it is important to pay attention to the right rock properties.

“We shouldn’t be gathering data for the sake of itself, which is a trap that as engineers we can fall into, wanting to reduce all uncertainty to the nth degree,” he says. “Data acquisition gives us a platform to work with. When we understand the rock, we can custom-design the drilling and completion programmes.”



“Small differences in rock play a large role in how a well will ultimately produce.”

*Dustin Young,
Halliburton*

Reducing costs

During the industry downturn operators are keeping a keen focus on reducing costs per barrel produced, particularly in shale, where gas is costlier to produce than in conventional reservoirs. The competition on improving efficiencies and reducing costs for goods and services led to a somewhat commoditised playing field in North America, Young notes.

Differentiation comes from a holistic, results-driven design with engineered solutions that can meet economic goals, he says. Halliburton’s own system for providing that to its clients is known as Listen and Respond.

“If an operator understands a profitable gas rate is X number, we can design a drilling and completion solution designed to help the operator meet that profitable approach,” he says.

Reducing, reusing and recycling also help control costs. For instance, the industry has found ways to reuse and recycle water, reduce the amounts of chemicals sent downhole, and reduce the space required for developments by using pad

drilling. Automating activities reduces equipment and personnel.

The industry has begun employing extended recovery techniques like gas and water injection, which had not typically been used for shale, and refracking existing wells in a bid to drive up production, he adds.

Technologies like frack sleeves and dissolvable tools have reduced stimulation and post-stimulation intervention time.

And reconsidering long-held beliefs can have benefits.

“The thought that to increase contact with the reservoir and ensure higher production rates all horizontal wells should be as long as possible with as many fracks as possible doesn’t always hold true,” Young says. Halliburton’s FracInsight, which predicts how the reservoir will respond to stimulation on a stage-by-stage basis, moves away from that approach and targets only spots with high production potential for fracking.

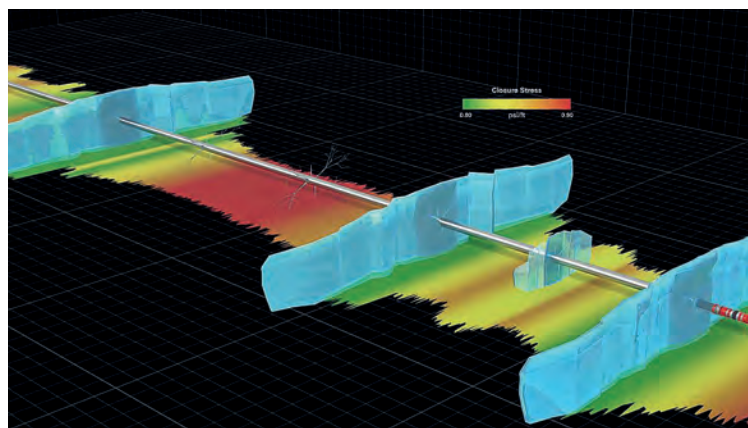
Public perception

Young notes the industry has become more transparent to the public regarding how shale gas operations work.

“There’s a lot we can do as an industry to promote the positive messages that come from shale gas developments,” he says.

That message will vary by where in the world the shale gas developments are taking place, he notes. For example, some operations are taking place in environmentally sensitive areas where the message should focus on environmentally-friendly technology and lower logistics. For operations where water may be scarce, the message would focus on lower use of water and recycling.

Young cites for example Horizon 2020, the European Union funding programme for research and innovation, which is involved in research to understand, prevent and mitigate potential environmental impacts and risks from shale gas exploration



DATA SET: A 3D image of a fractured well with closure stress log.

and exploitation. He urges the industry to be more proactive rather than reactive in communications with the public about shale gas developments.

“We can focus on environmentally friendly technology and use positive economic messages, such as the benefits of a more diverse energy mix,” he says.

Young believes shale gas reserves will continue to be developed because of increasing demand. First, he notes, many countries are looking to secure

their own energy supplies, and second, they are looking to diversify their energy portfolios.

Improved efficiency and economics will help drive shale gas demand.

“As technologies improve, it will lead shale gas to being a hot topic for the foreseeable future,” he says. “The industry can focus on continuing to develop reservoir understanding” and technologies and processes to reduce the environmental footprint. □

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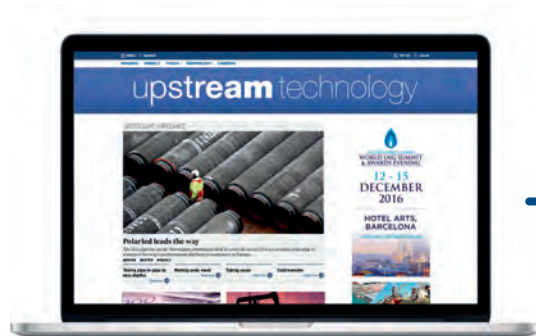
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