

# Why Can't We Apply Advanced Technologies More Often to Vertical Wells in Mature Fields?

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When I started working in the oil and gas business in the 1970s, we spent a great deal of time designing vertical wells. The horizontal well was by and large a far-fetched idea on everyone's wish list—the capability to have a completion go through the sweet spot was almost too good to be true. Fast forward to 2017 and we are now drilling horizontals everywhere, surpassing drilling times again and again.

But what about vertical wells, are we not still drilling those? The answer is “Yes, we are.” From 2011 to 2016, the industry drilled 117,624 vertical wells in the United States while, in that same time frame, it drilled 84,200 horizontals.

The fact is, vertical wells still have several key applications: They are typically used as the preliminary wellbore in exploration, production, and acreage delineation, and can be used for infill drilling, injection, and disposal.

So, can we not apply advanced technologies more often to mature vertical wells? We can, but two factors need to be considered when doing so—technology and cost.

First, embracing advanced technologies. Some energy and production companies lead the way in innovation while others are more risk-averse. Regardless, new technologies are consistently being developed, refined, and eventually adopted more broadly.

For example, vertical injection wells can be refractured using more advanced diversion technology, ultimately extending the life of the well or even potentially adding more reserves. Or we can accurately apply acid in a vertical well to establish better communication with a reservoir. Such applications are now part of the mature field landscape, but the widespread adoption of newer technologies often moves at a glacial pace.

The second factor is cost. We know that the application of advanced technologies can prolong the life of mature fields, but it has to be done cost-effectively. Mature fields are exceptionally cost-sensitive, and any high-dollar application must yield acceptable returns: You are not going to pump an expensive chemical into a well for a 0.5% return—it just does not make sense.

Looking ahead, the well intervention market for mature fields will be demanding more and more of our attention. By 2019, it is expected to be in the range of USD 13 billion per year globally.

So, what is the best approach for applying advanced technologies to the vertical wells in mature fields?

The first step is defining exactly what you want to accomplish in a given well—a clear objective sharpens the focus of what you will need to get there. The strategic approach to understanding is ensuring that the correct diagnostics are completed

and vetted against the available technologies. How much money do you want to invest in the project? What is the estimated attainable production yield? Do you want quick returns or a long-term solution?

The second step entails adopting an open mind regarding the application of advanced technologies, to think outside the box of convention and seriously consider the full range of what is available. You can then assess and analyze various technologies to determine which is best-suited to achieve the desired results in a cost-effective manner. Risk can be mitigated by “doing the homework” or by application of learnings from others currently finding success in the surrounding areas.

One example is a vertical well that is located in south Texas. The well was drilled in 1996 and declined to the point that it was shut in in 2013. The well was refractured in 1996 and 1999 to keep the production up but it continued to decline rapidly. Tubing was replaced in 2003 but even with all the maintenance effort, the well went from initial production of 400 Mcf/D to 10 Mcf/D.

In 2014, the operator made one more effort to revitalize the well by using advanced technology. A tool was run via slickline that discovered a hole in the tubing. The tubing was replaced, and a two-stage refracture was performed using advanced proppant technology. The well came back on producing 1.5 MMcf/D. With a USD 250,000 investment by the operator, a little design work, and some faith in applying newer techniques, the operator was able to exponentially increase production and avoid abandoning the well.

Can we afford not to use the right application of technology to get the maximum value for the asset? **JPT**



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