

## DRILLING

# Keeping Inside The Envelope

*Geosteering specialist strives to keep horizontal-well operators within targeted zone*

AS IT HAS IN CANADA, drilling for oil and gas in the United States has evolved to the point that most of today's wells are horizontal. Like their Canadian colleagues, American oil and gas executives have found that, despite higher costs, horizontal wells are nearly always more productive, delivering more bang for the buck than vertical wells.

"Before 2008, horizontal drilling made up 20–25 per cent of drilling in the United States, but today, close to 70 per cent of wells [in the United States] are drilled horizontally," says Ken Bowdon, president and chief executive officer of Horizontal Solutions International (HSI), a U.S. geosteering specialist. "In just a very short time, from 2007–08 until now, horizontal drilling has become the conventional mode of drilling."

Working solely on horizontal wells since 1987, HSI has capitalized on the trend.

**"It's best used when you've got a thin reservoir and a lot of structure happening, whether it's steeply dipping beds or faulted areas—that's where it's most effective."**

— Leslie Chisholm, Staff Geologist,  
Harvest Energy Corporation

Unlike some service companies, however, its business can be summed up in a phrase: keeping horizontal wells on-target. According to Bowdon, who "went horizontal" long before the broader industry, the logic of his calling is clear.

"The most expensive horizontal well is not the one that costs the most," he says. "It's the one that's not in-zone. The whole plan is to drill a well within a particular target. If it's not there, that's a lot of sunk costs, because the well will not perform as it should," he explains.

While HSI's flagship product is proprietary software for geosteering, arguably, its bread and butter is its staff of petroleum geologists who have spent years evaluating and drilling horizontal wells. By now, the group's total well count has passed the 7,000 mark, and Bowdon says some individual HSI geologists have interpreted more than 1,000 wells.

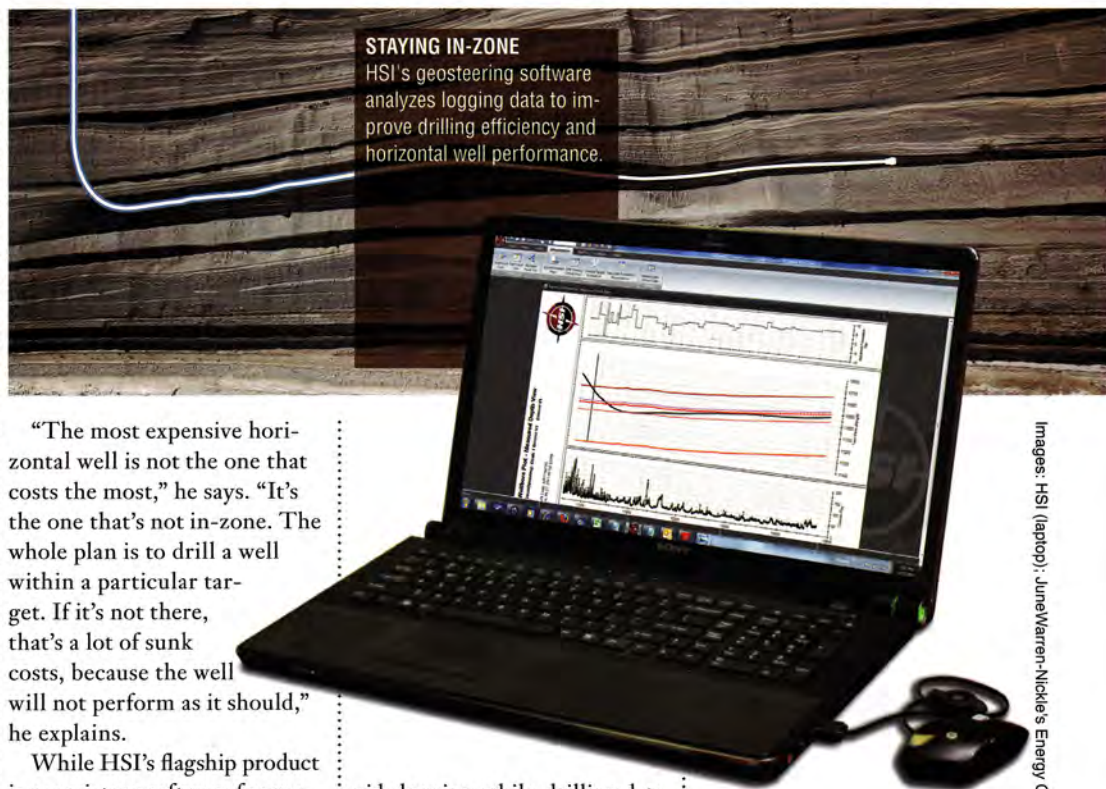
The company does not market downhole tools or hardware. Instead, HSI analyzes logging data to provide timely advice

geared to improve drilling efficiency and horizontal well performance. Part of that is being able to tell an operator when a wellbore is within the targeted section of rock, and being able to give them the information they need to stay within that zone.

Although an operator can buy different levels of expertise from HSI, the most common request is for interpretative geosteering services. Typically, producers provide HSI with directional survey data, such as depth, inclination and azimuth, that convey drill-bit position and well orientation. Equally critical, perhaps, producers pro-

"You can't make an accurate interpretation in truly real time. You make [it] as the surveys are recorded. The smallest increment we'll do on an interpretation is every 10 metres or so. Yet, more often, we're doing interpretations about every 30–50 metres, because the wellbore and beds are nearly horizontal. You may drill 10 metres, but only see a metre or less of rock."

Bowdon says it's important to understand the angle or "dip" of the beds in a formation, something that's a key derivative of the interpretation process, allowing drillers to adjust the inclination of the wellbore and



### STAYING IN-ZONE

HSI's geosteering software analyzes logging data to improve drilling efficiency and horizontal well performance.

vide logging-while-drilling data from the horizontal well being drilled, and historical logs from vertical wells drilled earlier in the same area.

Well logs typically received by HSI geologists include gamma ray, resistivity, density and sonic logs. However, the one that's most used, at least for geosteering purposes, is the gamma ray, Bowdon says. It's used in roughly 97–98 per cent of horizontal wells, although other logging data may also be relied on.

stay as close as possible to parallel with those beds.

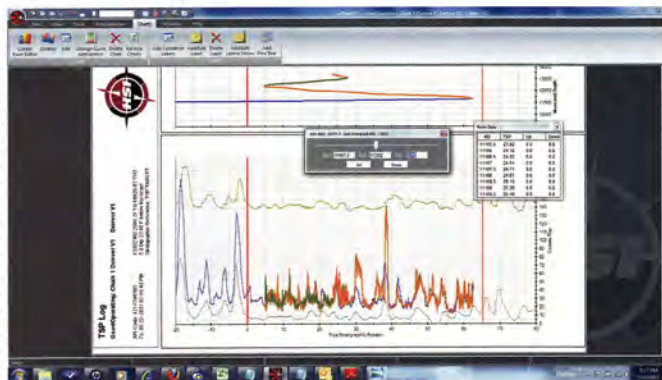
How often HSI provides interpretative reports depends both on how quickly the well is drilling and the geologic complexity of the zones being drilled. If a well is drilling moderately fast, say, 300 metres a day, two to three reports may be enough to effectively steer the well. On the other hand, if a well is drilling at ▶

1,000 metres a day, HSI might produce four, five or six reports a day to keep pace.

"It's an iterative process, and there is a lot of back-and-forth between our consulting service and the rig's drilling team," Bowdon adds. "It depends on how closely they want to be informed, how often they want reports, and that's up to the client."

While the vast majority of the wells HSI has consulted on were drilled in the United States, mainly in shale plays like the Barnett in Texas, the company has Canadian clients, including Calgary-based Harvest Energy Corporation. The company used HSI on several horizontal oil wells in western Canada, according to Leslie Chisholm, Harvest's staff geologist.

Agreeing that the service was cost-effective, she estimated Harvest spent \$8,000 to \$10,000 per horizontal well (the cost depends in part on



**CHEAP INSURANCE**

Software from HSI can tell an operator when a wellbore is in the targeted section of a formation, potentially avoiding a costly miss.

well length). "In the grander scheme, that's very reasonable, especially when you're in a situation where you're trying to make a call on whether to go up or down. And if you're lost, it's a lot cheaper than drilling a new well or a new leg of your horizontal."

At the same time, the service is not for everyone, she says. When an operator has relatively flat stratigraphy, and

knows exactly where he or she is, the service may not be so useful, especially if the plan is to multistage fracture the well. On the other hand, when the operator wants good exposure to rock and the ability to stay in-zone as long as possible, especially in a structurally complex area, "it's a nice backup system to have," she says.

Chisholm emphasizes there is no perfect method of staying

in the target zone. Due to rock faulting, for example, the wellbore trajectory can be knocked out-of-zone.

"When you get faulted out, it's always difficult, but [HSI] is basically cheap insurance as a backup, to help you decide what's going on. It's best used when you've got a thin reservoir and a lot of structure happening, whether it's steeply dipping beds or faulted areas—that's where it's most effective."

Back at HSI's headquarters in Carrollton, Texas, Ken Bowdon suggests that, at its most basic, the company is selling not just software, but the firm's experience in analyzing and interpreting geological and logging data, and applying it to new, horizontal prospects. •

**James Mahony**

**CONTACT FOR MORE INFORMATION**

Rick McCulloch, HSI Canada,  
Tel: 403-910-0311,  
Email: [rmcculloch@horizontalhsi.us.com](mailto:rmcculloch@horizontalhsi.us.com)

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