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Exploration Technology

Show me the oil!



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New algorithms applied to post-stack data can provide a direct hydrocarbon indicator in certain reservoirs.

Why have direct hydrocarbon indicators (DHIs) gotten such a bad reputation over the years? Simple—they don't always work.

There was the classic amplitude vs. offset (AVO) frenzy in the 80s and 90s, where companies began drilling every single bright spot they encountered assuming it was gas, with some spectacular failures resulting. More cautious explorationists viewed AVO for what it was—a technology that could, in certain cases and with other data providing a constraint, indicate the presence of gas.

Houston-based Seismic Ventures has developed processing algorithms that can, in certain cases, detect the presence of both oil and gas. But Leron Wells, chief operating officer of the science & technology, is the first to point out that the technology has its qualifications.

It's not going to replace any other technology, Wells said. It's a complement to the suite of tools or data that the explorationist already has available. If you look at it from that perspective, it's a very good tool.

His clients would no doubt agree. Success rates have been as high as 18 out of 20 wells, and most clients report success rates of around 80%, quite respectable by industry standards. And while Wells is modest about the technology's place in the exploration toolkit, he said that some clients were experiencing tremendous failure, and the application of the DHI technology completely reversed their fortunes.

When we see a situation like that happen, we wonder just how important the technology really is, he said.

For gas, the technology looks at energy absorption, a way of taking a post-stack dataset and evaluating the relative amplitude and the abnormal frequency absorption on any given reflector. This is often associated with gas in the pore space.

We have a number of clients that, by using off-the-shelf data, have had good success rates with this technique, Wells said.

It can be fooled by hard streaks, wet sands and zzz gas, but he said that most trained interpreters have the ability to distinguish between these anomalies.

For oil, low-frequency data is studied. For some reason we don't understand the physics behind it—oil has a way of reflecting strong low-frequency information, he said. So we're able to key on that in certain areas.

While DHIs for detection of gas seem to work well in all areas, DHI for detection of oil doesn't work well on the Gulf Coast but works well in hard-rock areas like California and North Texas.

Seismic Ventures has a few competitors, but Wells said that one of his company's key differentiating strategies is being up-front with clients and educating them about the process, outlining in detail the risks as well as the rewards. He refers to it as being associated with success.

The downside from a marketing standpoint is that most companies don't like to crow about their successes because they like to keep that information close to the vest.

Whenever a client is generous enough to allow us to use them as a reference, we like that, he said. Our clients are actually some of our best salespeople.

DHI technology is not likely to become a sure way to find hydrocarbons, any more than seismic is a sure thing now. It's not a process that can be quantified. The exploration side of this business is a science of anomalies, Wells said. There's a certain art form to interpretation and processing. A great explorationist who can interpret all the data he or she has available and come up with a prospect, or not come up with a prospect—there's a certain art form to that.

The engineering side of the business is important when it comes to drilling a well or developing a reservoir. But the location of the greatest discoveries really doesn't involve engineering. **E&P**

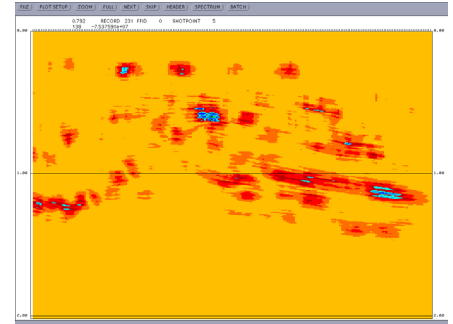


Figure 1. The DHI attribute that correlates with oil production in Southern California.



Figure 2. The seismic data that was used to derive Figure 1. (Image courtesy of Seismic Ventures)

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