Exploring trends in exploration

ION CEO Bob Peebler takes a glance into the seismic crystal ball.

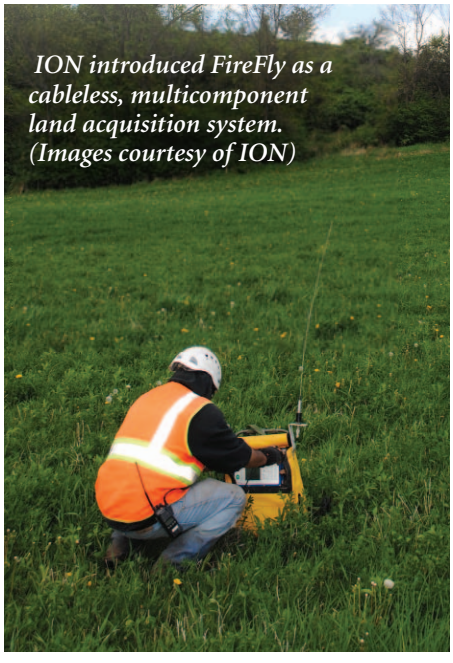
By RHONDA DUEY, Senior Editor

The oil industry can be a very unforgiving place. Just when it seems the cycles are becoming predictable, something happens to stand conventional wisdom on its ear. For example, it used to be that signs of an uptick were first felt in the most upstream part of the market – geophysical companies. But when the market began to turn around in 2004, these were the companies that continued to struggle while day rates for rigs went through the roof.

That does not mean the folks who head up geophysical companies are no longer good prognosticators. To keep their companies solvent, they have to be. So to get a handle on what the oil and gas industry has to look forward to in the coming years, *E&P* talked to Bob Peebler, CEO of ION Geophysical, one of the world's largest seismic technology companies.

Companies like ION have a somewhat unique perspective on the industry. Their clients are a mix of geophysical contractors, which are happy to continue using existing equipment to keep capital costs down, and oil and gas companies, which are interested in new technology to help them find more oil and gas more efficiently. Fortunately for companies like ION, oil and gas companies often "encourage" contractors to outfit themselves with the latest seismic technologies, and the oil companies themselves seek the latest technologies, such as advanced data processing techniques, that will help reduce exploration risk and maximize production.

Reflecting on the last year and a half, Peebler characterized the global economic meltdown as a "speed



ION introduced FireFly as a cableless, multicomponent land acquisition system. (Images courtesy of ION)

bump" that has slowed, but not stalled, some of the drivers that led to US $150/bbl oil in 2008. "Despite the speed bump," he said, "not a lot has changed. Asia is growing, developing countries are growing, and the demand for energy hasn't stopped. It just slowed down. It's not going to take much recovery to go back to where supply is tight, at least for oil."

Peebler's view is that the industry still is in a long cycle as it relates to supply and demand, with the speed bump dividing the long cycle into two halves. In the first half of the cycle, the industry was capacity-bound. While the speed bump changed that, Peebler said it was only a matter of time before the imbalance began to self-correct. The sudden drop in prices, and the inability for natural gas prices to fully recover, has changed the mindset of oil and gas companies, he said.

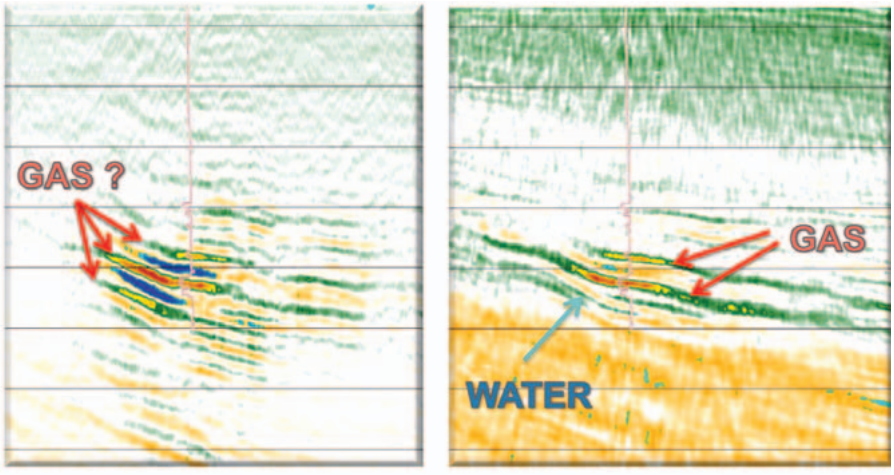
But lower commodity prices are not all bad from a technology standpoint. It is during the downturns that greater efficiencies are gained. "To make a project work, you have to have more efficiency," he said. "You either drill fewer dry holes, or you produce more efficiently. That drives technology."

This is particularly true in unconventional gas plays. When natural gas prices were $13/Mcf, it was all about poking more holes in the ground. With prices well below half of that, producers are becoming more interested in learning about their assets. Why are all the perforations not flowing equally? Why do two similar wells have completely different production rates? How can hydraulic fracturing programs be optimized by, for instance, targeting the most brittle reservoir rock? "That's an invitation for people in the technology world," Peebler said. "It's our sweet spot."

Seismic in shales

Peebler sees a growing interest among his oil company clients in the use of seismic data to inform their shale operations. Economic viability in shale plays traditionally has been achieved through two engineering technologies, horizontal drilling and hydraulic fracture stimulation. Peebler says lower gas prices are creating an increased interest in the use of seismic data to not only help the drilling engineer "stay in zone" and avoid geohazards but also help operators prioritize acreage positions and drilling locations, optimize their drainage strategies and well spacing, and better design their stimulation programs.

"We're really starting to see a pickup in quote activity related to shale projects," Peebler said. "We've completed a project in Colorado's Niobrara and have projects in various stages in the Marcellus. All of a sudden, the engineers in the asset teams realize that seismic can play a part in reservoir development planning. The shales may be pervasive in a given area, but the quality of the reservoir may be



Better processing techniques are pushing multicomponent seismic data into the mainstream.

very variable from one part of the play to the next."

Peebler says the heightened interest in E&P in shales also has led to greater uptake of multicomponent seismic, in which both shear and compressional waves are measured and introduced into the interpretation process, yielding a more comprehensive image of the subsurface. ION embraced the technology several years ago, dubbing it "full-wave imaging" and introducing its VectorSeis sensors to conduct these surveys. In 2005, ION brought its cableless FireFly acquisition system to the market to enable cost-effective recording of full-wave data in a variety of hard-to-access onshore environments.

For Peebler, taking the additional measurements seems like the right thing to do. "Doesn't it make sense that, if you can record all of the information, you'll have a lot more information to work with? Then it's a matter of processing that data and getting the relevant information out."

For several reasons, however, the industry has been slow to embrace the technology. One reason, Peebler said, is its legacy. "People tried it in its infancy, and it didn't fully meet their expectations. It was one of those cases where the first round of technology was just too early. We had the sensors to record the data, but we didn't have the processing techniques to make sense of it," he said.

In the early days, a multicomponent dataset could take three to four times as long to process as a conventional dataset, time that most processors did not want to spend. Since multicomponent acquisition technology was first introduced, however, the processing side of the industry has made quantum advances in compute power, significantly reducing the time required to process large volumes of multicomponent data.

Cost, of course, is another barrier. A single digital sensor costs three times as much as an array of geophones, and contractors are loathe to spend the money to upgrade their crews. Peebler said it is ION's job to engineer some of the cost out to make the systems more competitive. "My view is that as we're developing more and more applications, there will be a tipping point where operators will ask, 'Why wouldn't we do this?'"

Peebler says ION now has more than 30 full-wave processing projects under its belt. "In 2004, we had one expert in multicomponent; now we have several dozen doing multicomponent data processing full-time." The company finally has the data samples to prove the benefits of the technology. And it has a potential new client base since multicomponent seismic has been shown to help characterize lithology changes, fractures, and rock brittleness in shale plays.

Other advances

On land, Peebler sees potential for advances in source technology. Already autonomous shooting has enabled land crews to reach incredible levels of productivity since geophysicists now know how to filter out additional noise during processing. But the vibrators themselves are undergoing increased scrutiny as well, he said.

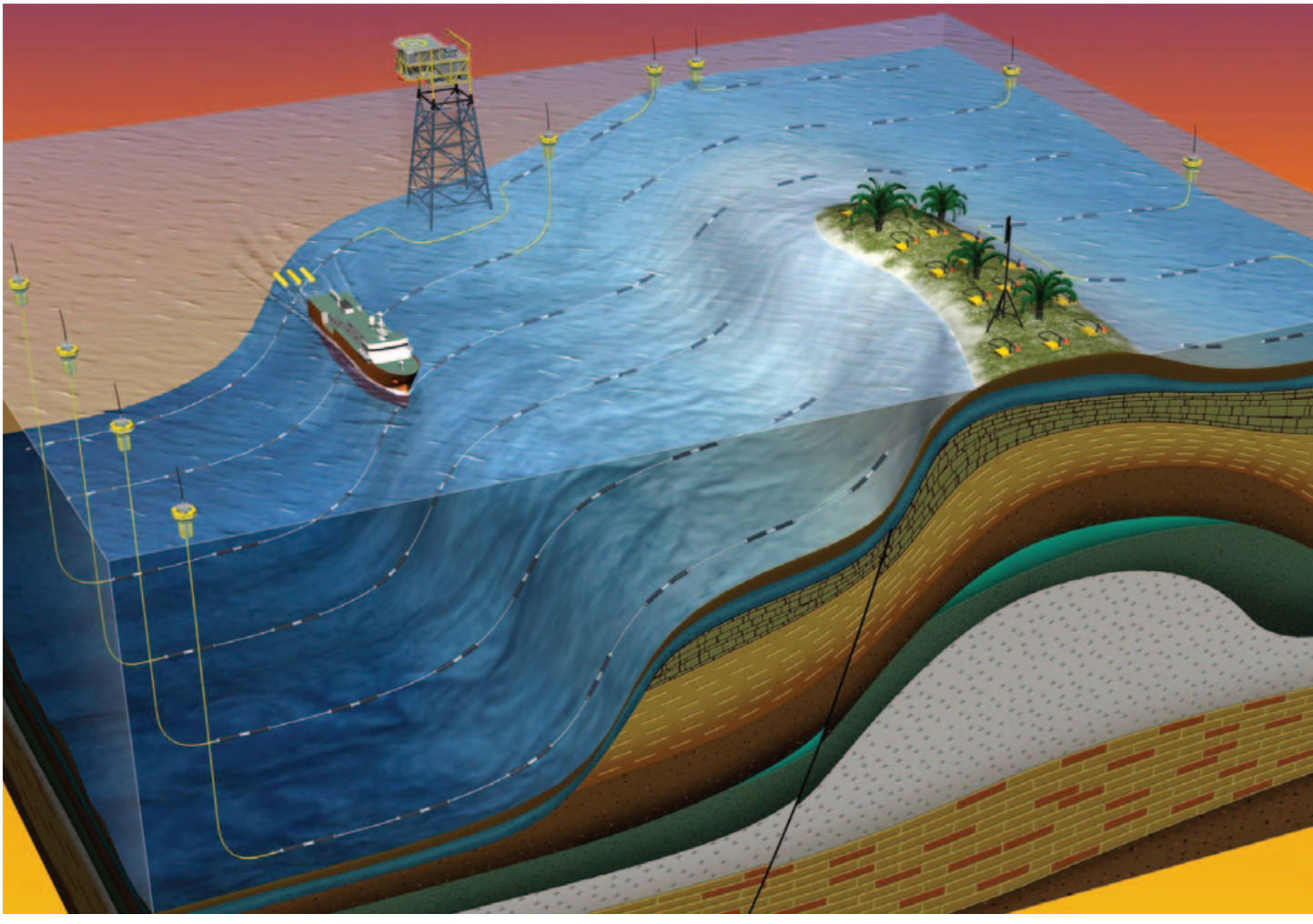
"We're up against some physics and hydraulics issues," he said. "But I think there are some breakthroughs awaiting us in source technology."

In the marine environment, one common trend is to put more sensors on the seabed. While ION has not moved into the node arena, it is an active supplier of ocean-bottom cables (OBC) through its VectorSeis Ocean (VSO) technology, to which RXT of Norway had exclusive access until earlier this year.

"If you put the sensor on the seabed correctly, you get better data than streamers," he said. "So, if that's the case, why would you do a towed streamer survey? Well, the easy answer is because it's about six times less expensive. But the data you get with full-wave acquisition from the seabed is phenomenal. We have a major oil company in West Africa that has told us that VSO has enabled them to see things they've waited 25 years to see."

OBC technology has been the victim of the same type of lethargy as multicomponent seismic – better data, but at a much higher cost. Peebler thinks that balance could be about to tip. "I think we'll see ever-increasing OBC," he said. "We're putting a lot of dollars into getting the capital cost down and making it more productive. If we can get it down to two times the cost of streamer surveys, I think the market will triple or quadruple in size."

Towed streamers also are beginning to undergo significant changes. Peebler said that up until now, the biggest breakthrough has been switching from oil-filled streamers to solid streamers. But new systems such as PGS's GeoStreamer, what Peebler refers to as "smart streamers," will



Bringing the cost of ocean-bottom systems down can triple or quadruple the market for this technology.

become prevalent, and the streamers will become part of a larger "smart system" that includes command and control software, combined seismic and electromagnetic measurements, and smart streamers all integrated in a single platform. "The days of piecemealing technology subsystems may be coming to an end," he said. "We'll have the ability to implement some very complex survey geometries that are tied to the subsurface targets we're trying to image and, if things unfold as we expect, we'll be able to interpret more of the data on the ship and make real-time adjustments to the paths of the source and streamer vessels and to the acquisition spreads."

Looking farther afield

Peebler said that companies like ION are in a unique position because oil company R&D teams and inventors often pitch ideas to them. This has been a natural development at ION – he said the company does not make a special effort to look to other industries for ideas but rather relies on its network and personal relationships.

"I believe in the random theory," he said. "With everything that I've been involved with that's new, if I were to have set up a process to identify it, it wouldn't have come to me. It's always something that comes over the wall from an unexpected source. And many of the best products come together when we integrate complementary technologies from multiple sources."

One way to look at new technology is to examine it in reverse. What if, for instance, cableless systems had always been the norm? Would it make sense to replace them with a cabled system that weighs twice as much and requires stringing cables over vast areas?

According to Peebler, "The trends are clear. Exploration is getting harder. The easy reservoirs have already been found, so now we're out there looking for the deeper and more subtle targets. The only way to find them will be through the evolution of technology. Fortunately, I see no changes to our advancements in deploying more receivers, recording higher bandwidth data, or in having the compute power needed to process it all. We're going to look back on the business in a few years, and the way we're doing things now will look clunky." EXP