

Exotic exploration tools conservative?

One company uses unusual methods to improve its success rate, and reduce finding costs, in Goliad County, Texas.

by Vernetta Mickey

Using exotic exploration devices to chase shallow come-and-go stratigraphic sands is considered a conservative exploration approach by Cambridge Oil Corp. of Houston.

The alternative to using subsurface control to pursue gas objectives in Goliad County, Texas, frequently can lead to dry holes. That's something few companies can afford in this time of low gas prices.

"We can't do anything about the cost of gas," explains Cambridge chief geologist B.J. Doyle, "so we have to reduce our finding costs, partially by improving our success rate."

The company has drilled 25 wells in an 18-month period in the Goliad County play, with seven dry holes. The strike-trending bar sands offer some generous potential at 2500 ft. For example, the Cambridge Oil Co. 4 O'Connor tested for a CAOF of 16 MMcfd, establishing the Willmarg (Catahoula) Field. Yet that well was drilled between two dry holes. Development success rates are little better than wildcat success rates in the area, Doyle says, which indicates subsurface geology is a poor development or exploration tool.

In the last several months Cambridge Oil has been applying seismic stratigraphy, and more recently electrotelluric surveying, to qualify prospects before drilling.

The approach is unusual for several reasons. The upfront exploration costs are increased, but they're still lower than drilling \$60,000 dry holes, Boyle says. The application of seismic stratigraphy is atypical onshore, but very common offshore, where there is less subsurface control, seismic acquisition is a bit easier and where quality data must be obtained.

Seismic stratigraphy is more expensive than conventional seismic, because it requires more enhanced processing, often with color, and sophisticated

computer interpretation techniques. It's unusual to apply seismic to shallow exploration, Doyle notes. The independents who pursue shallow plays don't spend the money for seismic; the majors who have the seismic don't bother with shallow reservoirs.

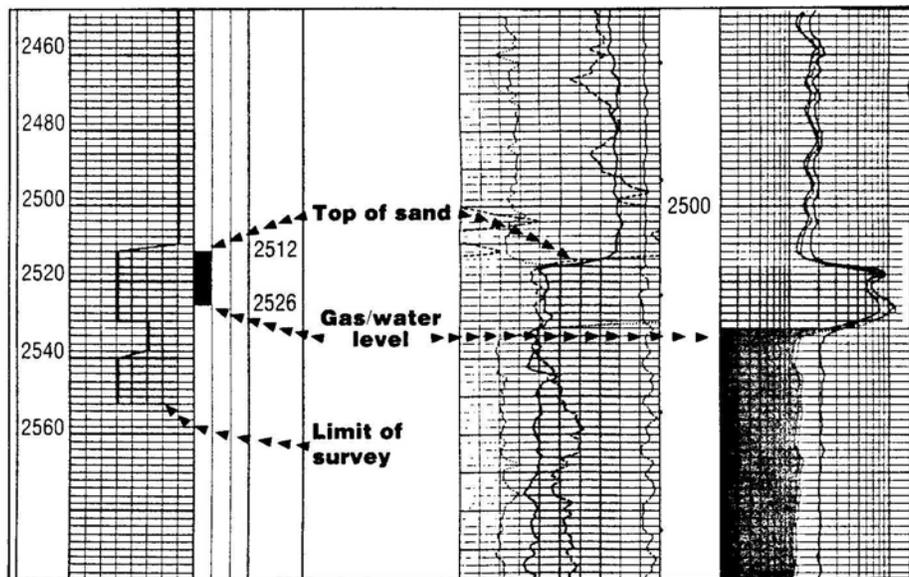
So far the application of seismic stratigraphy has been beneficial in the Goliad County play. Of the last six wells drilled off seismic, five have been commercial, Doyle says.

The company is participating in a 200-mi group shoot being conducted by Acoustic Exploration Inc. of Houston. Out of that shoot Doyle expects to find

device, the Petro-Sonde. The device was run on two development locations prior to drilling.

The Petro-Sonde Service offered by Geophysics International Corp. of Dallas uses a passive geophysical instrument that detects and analyzes the electrical field at the earth's surface, according to the company. Electrical pulses created by the interaction of solar radiation and the earth's ionosphere penetrate the earth. These pulses are re-radiated to the surface by planes of contrasting conductivity in the subsurface.

The Petro-Sonde sensor detects the



Close calls

The Petro-Sonde, left, was run on the 5 and 6 O'Connor offset locations prior to drilling. Subsequent wireline logs showed the tops of the zones had been accurately pinpointed and the gas-water contacts were closely picked.

many small leads, but additional information is needed to qualify those leads to find drillable prospects. Shooting more seismic is expensive, so Doyle has been experimenting with several "black boxes" in the area.

Most recently he has been focusing on using an electrotelluric surveying

changes in the electrical field which correspond to lithological contacts or variations within a formation, such as changes in porosity, fluid content, mineral concentration or large voids, the company says. Each signal collected by the sensor from a given depth is transduced into an audible signal.

GEOPHYSICS

The Petro-Sonde operator hears these varying signals through a set of headphones and produces a log that reflects the "lithological signature" and the "content signal" plotted as a function of depth.

"The Petro-Sonde was exceedingly accurate," Doyle says. "It was as accurate as the electric log measurement, coming within three to four feet in predicting the top of the sand at 2500 ft."

The two offsets were not duplicates of the original well in net footage of pay, Doyle notes. The discovery well had more than 46 ft of pay, one offset had 16 ft and the other, 26 ft.

Doyle finds the technique to be cost-efficient because it evaluates specific intervals. Other methods tend to give an areal spread of an anomaly, but not the depth, he notes.

One limitation of the system is that data quality and accuracy are sensitive to severe atmospheric conditions, solar flare activity and diurnal changes. Another concern is assessing the reliability of the tool when human interpretation is such an integral part of the system.

"The Petro-Sonde was exceedingly accurate. It was as accurate as the electric log measurement, coming within three to four feet in predicting the top of the sand at 2500 ft."

—B.J. Doyle, Cambridge Oil

The operator plots the Petro-Log graph based on variations in audible tones. Experienced, well-trained operators are essential to the system's success. Doyle says.

Unlike most exploration tools of the 1980s, the Petro-Sonde produces a final interpretation of the well site. with no computer data to process, no digital tapes that can be recomputed with another program.

"To see the system running you'd find it hard to believe that somebody was wasting their time and money on it," Doyle says. "The first time I watched that fellow sitting in his car

with a little metal briefcase, wearing a headphone and hand-drawing a log, I felt a little stupid, to put it bluntly."

The strength of the system is in its ability to identify formation tops, Doyle says. He has less confidence in its "content signal," which is supposed to indicate the potential presence of oil, gas or water.

On its most recent trial for Cambridge, a single reading by the Petro-Sonde indicated a positive potential on an offset to a discovery. The well was drilled and logged and turned out to be a dry hole with no structural relief. Doyle says the missed call is a source of relief.

"If it were accurate 100% of the time, there'd be no need for geologists," he quips.

He intends to use the system again, and one interesting test will be on a 6000-ft wildcat that Cambridge is planning to drill in Goliad County. Of hopes that combining the capabilities of seismic stratigraphy and electrotelluric surveying will help spell success for the 40-well program the company has planned for Goliad County in the next several months.