UH professor making waves in deepwater drilling

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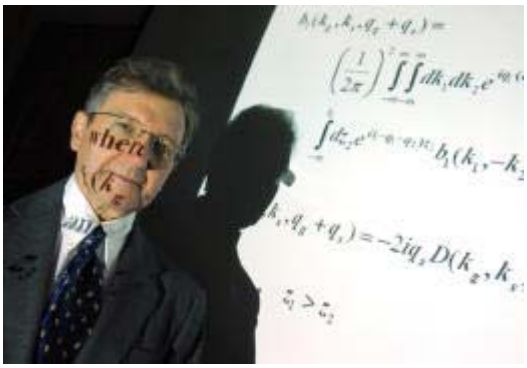

DAVE ROSSMAN : FOR THE CHRONICLE

University of Houston's Arthur Weglein says he has a found a way to make existing seismic data “talk” to one another to produce a clearer picture of subsea formations.

No matter how big the oil company or smart the scientists they employ, drilling for oil in the deepest waters of the Gulf of Mexico may always be a gamble.

Little by little, however, Arthur Weglein is helping to improve the odds.

Research by the University of Houston physics professor, along with faculty colleagues and graduate students in a program he directs, has led to advances in the field of seismic exploration technology that have played a role in recent major oil discoveries in the Gulf of Mexico, off Brazil and elsewhere.

Today his team is close to completing a theory that could be another leap forward. Though it would use conventional seismic equipment, it calls for a fundamentally different approach to processing the data.

In an attempt to remove the “noise” sound waves pick up as they travel thousands of feet into rock beds and out again, Weglein said he has a found a way to make existing seismic data “talk” to one another and link information to produce a more accurate picture of subsea formations.

Such images could help oil companies reduce drilling risk and provide an invaluable road map to the industry in its global hunt for energy resources.

“Our goal is to make the currently inaccessible petroleum target accessible and the accessible better defined,” Weglein said in a recent interview at the University of Houston building where he teaches.

That mission has gained importance in recent years, as higher commodity prices and rising world energy demands have pushed oil companies into ever-deeper waters and into more complex rock formations in search of resources.

Limitations found

Along the way, the companies have encountered limitations in traditional seismic survey technology that has been the industry standard for years.

Seismic surveys use sound waves to determine the composition of subsurface rock layers, yet they have had trouble providing accurate data through salt domes that often trap oil deposits underneath.

Rather than shooting straight through, bouncing off the target and coming back to the surface where the data is collected, sound waves tend to bounce around several times in a salt dome before emerging, creating readings called "multiples" that make interpretation of the data difficult.

What's really there

Weglein is perhaps best known for theories and processes that have helped remove these multiples and achieve a better picture of what lies beneath a salt dome.

That research laid the foundation for Weglein to establish the Mission-Oriented Seismic Research Program at the University of Houston in 2001, with the backing of more than a dozen corporate sponsors including Exxon Mobil Corp., BP and Shell.

"All of those companies are members because of Art Weglein," said Tom McClure, IBM's business and technical manager for deep computing to the petroleum industry and a member of the program's board.

The program is at the forefront of UH President Renu Khator's effort to make the school a leading hub for energy industry education and research.

Even member companies that don't use research produced by Weglein's program see value in supporting it because of its potential to improve subsurface images extracted from seismic data.

"Better images lead to more effective oil and gas exploration, particularly in geologically complicated areas such as the deep water Gulf of Mexico," said Bill Dragoset, geophysical adviser with WesternGeco, oil field services giant Schlumberger's seismic business, and another member of the consortium's board.

Doubts arise

Weglein, however, will be the first to admit there are plenty of naysayers about his current theory, which he will present at a conference in Egypt in November and hopes to field test next year.

"What we're aiming to do is to get the target located and delineated without needing to know anything above it," he said.

By contrast, traditional seismic imaging methods require an estimate of the speed of a sound wave as it travels from the water's surface, into the earth, bounces off a target, and returns to the surface.

Oil companies may spend years and hundreds of millions of dollars trying to interpret such data and map a formation, but deciding where to drill still involves a lot of guesswork, Weglein said.

Last year, for instance, oil companies drilled 85 exploratory wells in water depths of 1,000 feet or greater in the Gulf of Mexico but only announced 15 discoveries, a success rate of about 17 percent, according to the U.S. Minerals Management Service. And at more than $100 million per well, the cost of dry holes can add up quickly for oil companies.

Domestic oil potential

Weglein believes his new theory will help boost the success rate in the deep water and allow oil producers to revisit shallow-water areas where salt domes had blocked their view. It could even reveal far more oil in U.S. waters than previously thought.

A recent Interior Department report said unexplored areas of the Outer Continental Shelf could contain some 86 billion barrels of oil and 420 trillion cubic feet of natural gas, though not all is economically feasible to recover.

But those who try to predict the amount of petroleum left in the U.S. or the rest of the world, Weglein said, are “destined to be incorrect.”

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