ENERGY

X-ray gun gives drillers better shot at finding oil

A research scientist at the University of Texas has sharply picked up the pace in analyzing core samples from wells

By David Hunn | September 2, 2016 | Updated: September 5, 2016 7:01pm

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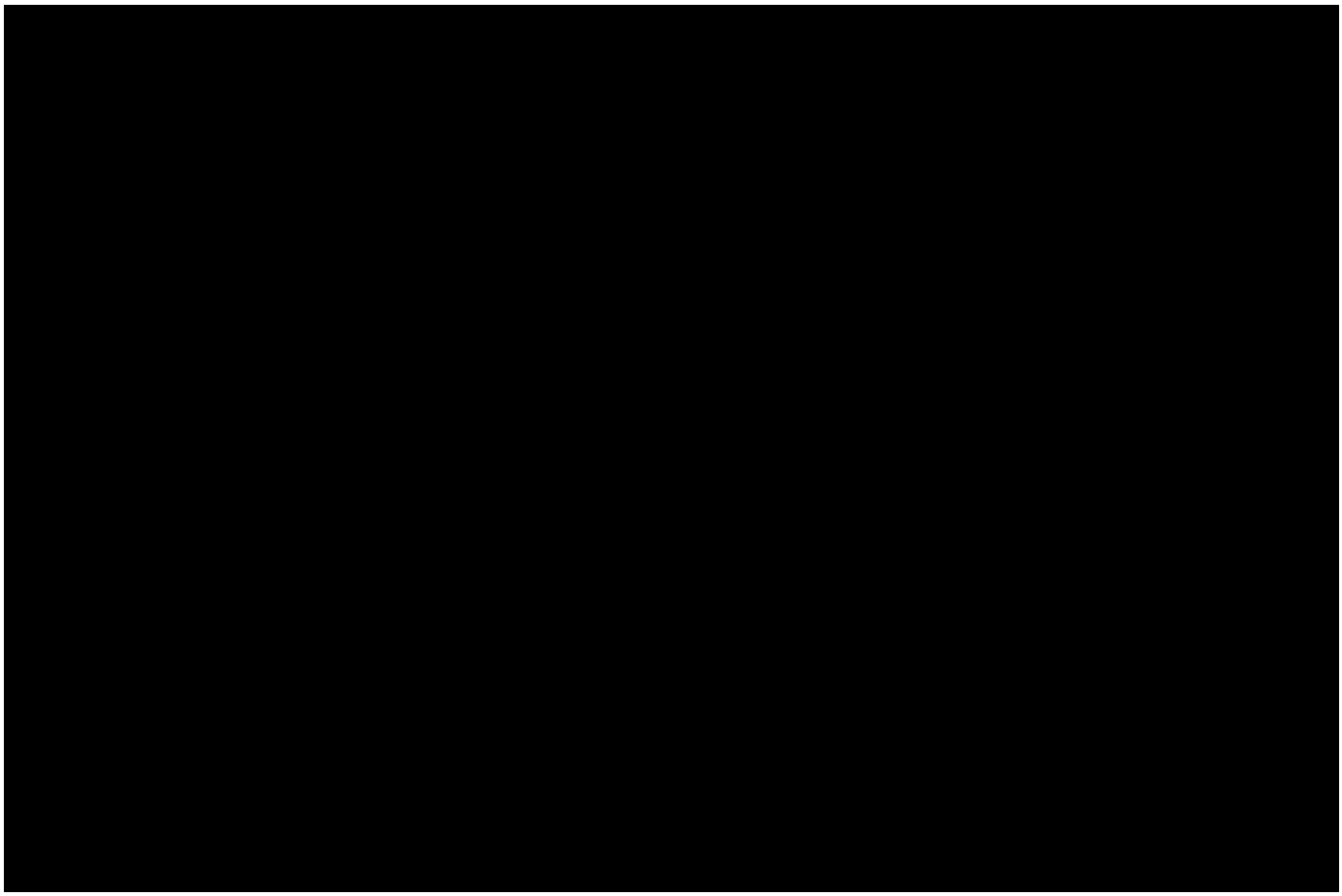
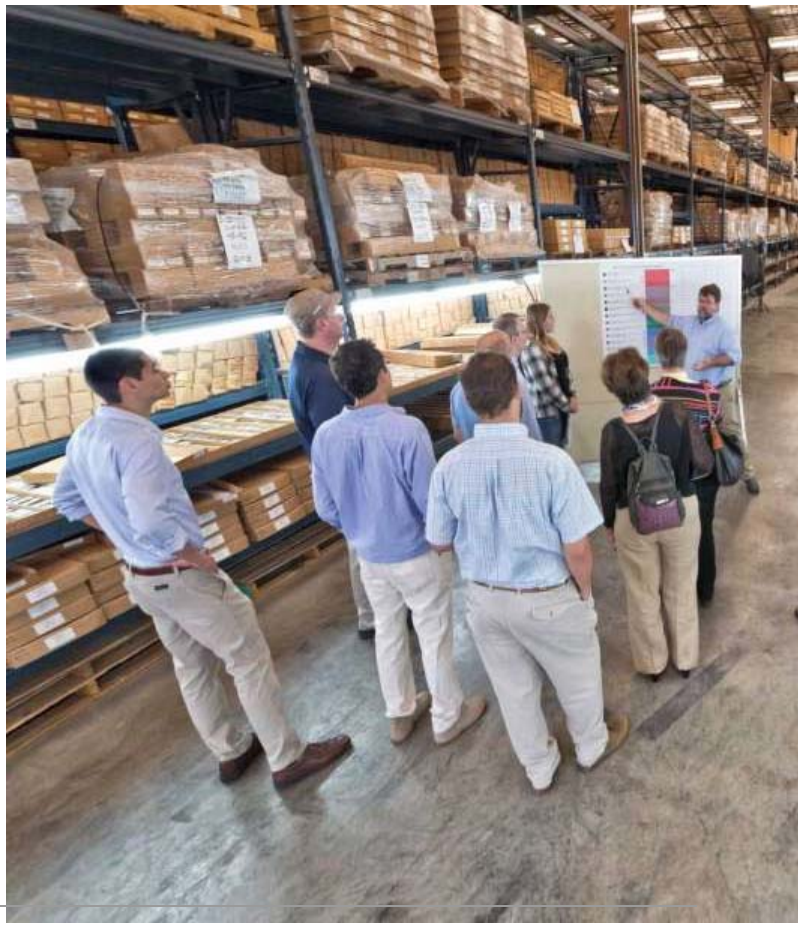


Photo: David M. Stephens

IMAGE 1 OF 3

Harry Rowe, a research scientist at the University of Texas Bureau of Economic Geology, explains X-ray fluorescence technology to industry representatives in the university's oil well core sample warehouse.



AUSTIN - Harry Rowe has a ray gun. It's small and gray and might, he thinks, change how companies dig for oil.

Rowe is a research scientist at the University of Texas Bureau of Economic Geology. For years, he's been trying to figure out how to speed the analysis of core samples - cylinders of rock that well drillers bore out of the ground with hopes of finding clues to the potential oil below.

Until recently, companies sent core samples to a lab for analysis. It took weeks, if not months, to get results.

Rowe figured out how to do the same work in hours.

It took hundreds of rock samples, tens of thousands of measurements and an X-ray instrument that looks something like a science fiction weapon.

But now Rowe can take his gun to a well, point it at a core and, after a bit of rock-cleaning, tell an oilman if his land will likely produce 10 barrels of oil per day, or hundreds.

"Now we have this portable device. We can simply go along and take a sample wherever we want," Rowe said.

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The process isn't actually that simple. The rock needs to be cleaned and sometimes

crushed into a pellet before it's analyzed. Most companies use larger bench-top versions of Rowe's gun.

Still, they can help decide drilling strategy in real time, Rowe said.

Technological advances are fundamentally changing the oil and gas industry. Drill-head sensors allow geologists to steer drill bits within feet of their targets. Terabytes of computer data help companies constantly analyze the efficiency of their drilling progress and petroleum recovery. Seismic imaging maps underground basins in vivid detail.

Some of those advances have arrived in surprising ways: Horizontal drilling and hydraulic fracturing, for example, weren't new technologies a decade ago. But the two together reversed declining U.S. oil production and helped create the shale revolution.

At the same time, they've exacerbated the need for high-tech tools. Fracking wells often are 10,000 feet deep, then turn and run 5,000 feet horizontally. They can cost $10 million to drill. Making a mistake, missing oil, is expensive. Even straying a few feet from the heart of the reservoir can be the difference between recovering 1,000 barrels of oil per day and recovering 2,000.

So oil producers want to know as much as they can about the rock they're drilling before they begin.

Rowe's work is just one piece of that. But it's an important piece, oil geologists say.

His gun adapts an old technology, X-ray fluorescence - used by miners to analyze rock elements, doctors to measure chemicals inside the human body and even archaeologists to reveal ancient inscriptions. The device, called an XRF analyzer, shoots X-rays at the target. The X-rays hit and dislodge electrons. When other electrons take the place of those dislodged, they emit their own rays, which are read by a sensor in the gun. Each element in the sample releases its own specific X-ray - something of an elemental fingerprint.

Rowe and his university lab took that technology and calibrated it for shale drilling.

That means geologists can quickly tell oil companies what elements are in the rocks

bored out of each well.

Such measurements can be bellwethers for success. As companies drill, they can pull rock samples, test them and know if the well should be productive.

Certain trace elements - vanadium, nickel and uranium, for instance - tend to be highly concentrated in rock that has a lot of organic matter. And, in general, the more organic matter present, the more oil or gas the rock can generate.

"It's a very nice signal," said Michael Dix, a geoscientist at the service company Weatherford International who has worked on XRF for years.

The Pittsburgh-based oil and gas company EQT orders bench-top XRF units to well sites, said Randy Blood, a senior geologist there.

"Within 20 minutes, you have the chemical composition of the rocks," he said.

Blood says his bosses periodically ask him how confident he is in his analyses of potential oil or gas wells.

"I don't know, I wasn't there 410 million years ago," he tells them.

But with XRF, he says, he feels like he's as close to being there as possible, he said.

The technology has been slow, however, to catch on in the industry. The readings aren't perfect, and Rowe admitted the gun can be hard to use, especially for the uneducated.

Still, once workers understand how to use the guns, they produce fast, cheap and revealing analyses, several users said.

"Some elemental analysis, increasingly by XRF, is becoming almost mainstream these days," Dix said. "As we come out of the downturn, this is going to be a much more accepted practice."

Rowe uses guns sold by the scientific instrument-maker Bruker Corp., headquartered near Boston. The guns cost about $50,000.

And Bruker now caters to the oil and gas industry. It even has calibration software made specifically for shale and mudrock. A spokesman said device sales to energy companies climbed steadily from 2011 to 2015 and make up a significant share of U.S. totals.

Staff at the University of Texas are bullish on his work. They say XRF could revolutionize oil and gas exploration.

Rowe and his lab staff are now building a database with hundreds of core samples and thousands of measurements. A consortium of oil companies are adding their samples to the mix, and already using the database to make drilling decisions.

That's one of the things Rowe has brought to the field, Dix said. His calibration of the XRF gun has allowed him and his team to collect a great deal of data quickly.

But Rowe says a vast majority of the drilling companies still aren't using XRF in any format.

People are married to their ways, he said. If they've been using the same technology for 20 years, they can be slow to change. And if they've had a bad experience with the gun, they lose faith, he said.

"I could be wrong," he said, "but I think it's a grossly undertapped resource."

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