

Reducing prices at gas pump goal of UH engineers

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Developing radios no larger than a grain of sand to increase the drilling efficiency of oil wells, University of Houston engineers see promise for reducing prices at the gas pump.

"Our research could have a great impact on oil prices," said Richard Liu, UH professor of electrical and computer engineering and director of the university's Well Logging Laboratory. "Oil prices include everything, and drilling and exploration are pretty big portions of the cost. If the technology we're developing is viable, then costs would get tremendously reduced."

Liu is referring to a new technology that UH's Well Logging Laboratory presented at the group's recent Industrial Consortium hosted by the Cullen College of Engineering. The meeting focused on the essential aspect of oil exploration that records key attributes of oil wells during drilling, from the density of the rock being drilled to the size of oil deposits encountered.

Well logging, a technique used in the oil and gas industry for recording rock and fluid properties to find hydrocarbon zones below the Earth's crust, faces many obstacles. One of the biggest is transmitting data from the bottom of a well to the surface where it can be analyzed and drilling decisions can be made. Liu anticipates that this new technology, which provides more information to the individuals making drilling decisions, will improve the transmission of data, resulting in faster and more efficient drilling.

"It will allow for faster and more accurate drilling," Liu said. "When you get more information from downhole, you have a better understanding of the well's formation. The drilling becomes more efficient, which could result in lower gas prices for everyone."

Due to the extreme conditions encountered in oil wells, neither sending data through wires nor via standard wireless communication is possible. Temperatures in deep wells routinely surpass 300 degrees Fahrenheit and pressure exceeds 20,000 pounds per square inch, Liu said. The current method of a small pump near the drill bit repeatedly expanding and contracting causes vibrations in the mud at the top of the well that are translated into data at the rate of about 10 bits per second.

"That rate is simply not fast enough to relay all the pertinent information to the people making drilling decisions," he said. "The information is there. You can measure it, digitize it, store it, but you cannot send it to the surface."

UH well logging researchers, however, presented a new system using micro-electrical-mechanical-system (MEMS) technology that could increase the data transfer rate 100-fold to as much as one kilobit per second. MEMS-based technology enables the creation of near-microscopic machines on silicon wafers, the material used to construct computer chips, with well logging researchers using this technique to develop a series of MEMS-based radios, each no larger than a grain of sand.

As an oil well is drilled, these radios are distributed every six feet into the mud that fills the well, with the radio at the bottom of the well receiving data from the logging equipment. That information is then transferred up the well from radio to radio until it reaches the people on the surface.

While other institutions host similar groups, UH's Well Logging Consortium is one of the oldest and most well established, with the largest companies in the petroleum industry holding membership, such as ExxonMobil, Shell, Chevron, Saudi Aramco, ConocoPhillips, BP, Statoil, BakerHughes, Precision Energy Services, Schulmberger and Halliburton. Additionally, the Well Logging Lab is home to the world's only American Petroleum Institute-endorsed calibration facility for well logging tools based on nuclear technology.

Source: University of Houston

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