Head out to high-cost drilling environments – think deep water, for example – and there’s one constant you can always expect to find. You’re facing steep operation costs.

That dynamic sparked industry services company Schlumberger to come up with an innovative technology that has the potential to offer a cost-saving solution to an operator.

The technology entails acquiring and fast-forwarding crucial reservoir data to the operator, thereby enhancing the operators’ knowledge of the reservoir response for more efficient and timely decision making during reservoir testing.

The latest buzz centers on the company’s recently released Quartet downhole reservoir testing system, enabled by Muzic wireless telemetry. The system provides data in real time for validation, providing critical information needed to meet the well test objectives.

With it, operators can interact with the downhole test tools, manage reservoir events and refine well tests in real time.

Quartet uses wireless bidirectional communication to provide downhole tool status, along with pressure and temperature data. This allows test design modifications and validation of test data while reservoir testing is occurring.

The Quartet system comprises four leading downhole testing tools that deliver accurate pressure measurements and contaminant-free reservoir-representative fluid samples all in a single run, according to John Reddington, marketing and technology manager, downhole testing and tubing-conveyed perforating at Schlumberger.

**Four for One**

The four downhole tools making up Quartet are:

- **CERTIS** – Reservoir test isolation system having a built-in floating seal assembly that eliminates the need for drill collars and slip joints.
- **IRDV** – Intelligent remote dual valve is the control feature of Quartet, allowing bidirectional communication for tool command and verification. Removes the need for equipment requiring nitrogen pre-charges.
- **Signature** – This measurement tool is enabled by the new Signature quartz gauges, which provide wireless readout of downhole pressure measurements in real time.
- **SCAR** – SCAR inline independent reservoir fluid sampling allows independent, redundant sample capture via wireless commands.

“With offshore deepwater well testing you don’t want to rotate the string to set the packer, because you have umbilicals and control lines on the string,” Reddington said.

“The CERTIS packer system allows the packer to be set just by pressure, without rotations,” he noted. “Still, it allows the string to move due to the integrated floating seal assembly in order to compensate for expansion and contraction of the string and other issues.

“When you’re finished, you just pick the string up and pull the entire system out of the hole, leaving the well clean and as it was prior to starting the well test,” Reddington said.

Because the CERTIS isolation system eliminates the need for certain equipment, such as drill collars and slip joints, it simultaneously reduces the number of connections required.

Reddington emphasized the Signature quartz gauges are a central element in the Quartet system and also with any well test.

“All four technologies are crucial to perform the well test,” he noted. “But the reason to perform this test is to get the data from the reservoir, and all of the equipment is run to convey the gauges to get the data...”
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with respect to the reservoir.”

Considering the potential hazards to be encountered in getting a handle on accurate, timely reservoir data in challenging circumstances, even the most jaded of industry players likely will acknowledge the Wow Factor.

“In the very challenging deepwater environment, we’re now transmitting data in real time while performing the test,” Reddington enthused. “Once the data are at the surface, they can be transmitted to the client’s office anywhere in the world, so they can make decisions in real time regarding the well and the reservoir.”

Advantages of the Quartet system versus conventional strings include:

- Bidirectional wireless communication.
- No drill collars or slip joints.
- Fewer seals and connections.
- Multi-cycle flexibility.
- Single-trip efficiency.
- Less nitrogen.
- Lower operating pressure.
- Premium connections.
- Shorter string design.

Global case studies

Wireless Tool Gets Tested Around the World

By LOUISE S. DURHAM, EXPLORER Correspondent

The Quartet downhole reservoir testing system, enabled by Muzic wireless telemetry, was only recently commercialized by Schlumberger in 2013.

Already, reports indicate the innovative system has more than proved its value in the field.

Quartet has been deployed in 22 field trials in locales around the world, including Egypt, Indonesia, Qatar, Brazil and Angola, in locales ranging from onshore to deepwater.

The trials registered a 100 percent communication success rate in transmitting data from downhole to surface.

Quartet technology enabled by wireless telemetry was applied in Indonesia to meet a straightforward challenge: implement real time pressure transient analysis of bottomhole pressure (BHP) data to optimize well test operations conducted in a deviated offshore exploration well.

“The client sought a testing solution that would optimize operations because reservoir uncertainties and rig rates were high,” said Bengt Nilssen, testing services marketing communications manager at Schlumberger. “Wireless transmission of BHP and temperature data in real time was fundamental to attaining this goal.

“We proposed using Signature quartz gauges, which deliver high resolution pressure data, augmented even further with wireless telemetry,” Nilssen said. “This integrated approach enables bidirectional communication between the surface and downhole.

“Repeaters, installed at intervals in the test string, transmit wireless commands downhole and pressure and temperature data to the surface,” he noted. “Each gauge can be queried independently for both real time and historical data.”

Signature is one of four tools comprising the Quartet system. Each tool is considered to be equally applicable – yet not always required – in all environments.

Because the Indonesia field trial was not in deep water, a conventional packer was run instead of the CERTIS reservoir test isolation system, which eliminates the need for drill collars and slip joints.

“The Signature quartz gauges enabled by Muzic wireless telemetry successfully transmitted uninterrupted real time BHP and temperature data to the surface for seven days,” Nilssen said. “This helped the client truly understand what type of reservoir they were looking at.”

Brazil Case Study

Halfway around the world in offshore Brazil, the Quartet system was used to do its thing in a whole different environment.

“We're talking the ultra-deep water, pre-salt, which is known to test the skills and knowledge of the most seasoned operators.

“The challenge there was to quickly acquire real time well test data in the deepwater environment, while ensuring high data resolution and accuracy,” said Schlumberger's John Reddington.

To enable the client to optimize its deepwater well operations, Schlumberger proposed a real time communication solution on a well in the pre-salt Santos Basin, more than 150 miles offshore Brazil, according to Reddington.

Water depth exceeded 6,500 feet.

“This is an excessively costly market,” he emphasized. “The ability to deploy the CERTIS system with wireless telemetry means we could run this system much quicker than a conventional string, retrieve it quicker and have access to the data in real time much faster to be sure the objectives were reached.”

Deploying the wirelessly enabled Signature gauges on the pre-salt well test allowed the client to interact with downhole equipment, manage wellbore events and refine the test in real time.

Running the wireless system in this well required less than six hours of rig time versus 20-24 hours when using a standard wireline system, according to Nilssen.

“We saved rig time by visualizing downhole data during flow periods,” he said, “and eliminating the need to rig up a conventional surface readout system.”

The Results Are In

The Signature quartz gauges transmitted wireless downhole data continuously for 568 hours to provide the data necessary to optimize the well test operations in real time.

Reddington noted that the optimized test enabled the client’s engineers to:

- Observe perforating guns’ effect on pressure and confirm dynamic underbalance.
- Increase productivity when the well was flowing.
- Validate that sufficient data were acquired during the initial and main buildup periods to end them earlier.
- Establish reservoir pressure after the initial post-perforating flow period.

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