TRU-ARMS advanced reservoir mapping service

Unlock total reservoir understanding at a seismic scale.

The TRU™-ARMS advanced reservoir mapping service is an evolutionary leap forward in total reservoir understanding that illuminates the subsurface by mapping lithological and fluid contacts hundreds of feet away from the wellbore.

The TRU-ARMS service's real-time insights support customers' strategic decisions to ensure optimal field development—e.g., maximizing reservoir contact from a smaller number of more strategically placed wells—while simultaneously increasing the production and recovery potential of their asset.

The service leverages nearly two decades of experience with both shallow and deep reading omni-directional and azimuthal resistivity technologies to provide full 360-degree azimuthal coverage. The service operates at multiple frequencies between 1 kHz and 2 MHz when combined with the AziTrak™ deep azimuthal resistivity measurement tool. This range of frequencies helps characterize both the near wellbore as well as the deeper environment for superior mapping outputs.

Integrating industry firsts

The TRU-ARMS service incorporates several innovative, industry-first capabilities to sharpen subsurface understanding and optimize well placement.

- A disruptive transceiver concept, which adds flexibility to the objective-driven BHA design. Available in multiple configurations, the transceiver supports landing, geosteering, geomapping, geostopping, and formation evaluation. The transceiver's assignments are programmable and configurable, even while drilling, thus giving unprecedented flexibility to operations.
- An innovative antenna design that incorporates collocated and orthogonal antennas for triaxial, direct full electromagnetic (EM) tensor acquisition. This feature acquires all nine pure combinations of X, Y, and Z magnetic field components, yielding a higher signal-to-noise output compared to other antenna designs.
- Multidimensional inversions with embedded confidence analysis. These highly robust, hybrid inversion workflows produce multidimensional models that recreate 3D geology and provide sharper, 3D visualizations of reservoir distribution and quality.
- Expanded output capability from the Baker Hughes Advanced Borehole eXchange format. This unique advantage can tie multiple data sets, including acoustics and images, to the wellbore and will automatically shift the LWD/wireline data when new survey information might warrant a change in the position of the wellbore in the subsurface.

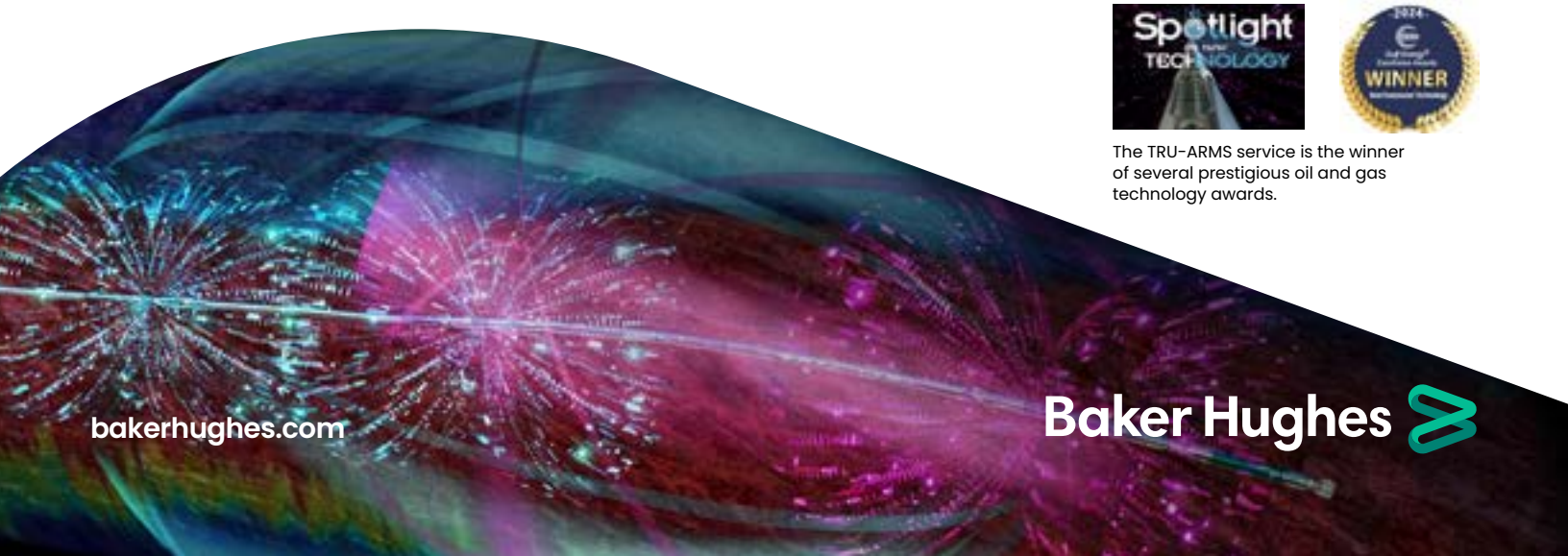
Applications

- Reservoir navigation for precise well placement in complex geological and structural scenarios
- Reservoir mapping of fluid and lithological boundaries
- Optimized landings and geostopping
- Elimination of pilot holes
- Reduction of drilling risks

Benefits

- Maximized production and recovery from increased net-to-gross with optimized well placement
- Improved reservoir modeling and volume estimates from maps of fluid and lithological boundaries
- Optimized field development by eliminating pilot holes, identifying infill targets, and delaying water breakthrough
- Improved seismic characterization from higher-resolution resistivity mapping
- Improved completion designs

The TRU-ARMS service is the winner of several prestigious oil and gas technology awards.



CASE STUDY: OFFSHORE

CHALLENGE

- Optimize wellbore positioning of the drain hole for maximum productivity within a challenging reservoir
- Provide insights into potential reservoir facies for subsurface model updates and future development targets

OUR APPROACH

TRU™-ARMS Services provided:

- Ultra-deep mapping and well placement
- Poro Perm estimation from NMR
- High-resolution imaging for fracture identification
- Formation pressure

RESULTS

- Record production rate with an "unusual level of success" in a mature oilfield
- Optimized well placement and mapped the reservoir to depths not previously achieved
- Inversions used to tie in with seismic data in real time
- Identification of fault zone and throw by TRU-ARMS potential remote reservoir facies identified
- Comprehensive while drilling formation evaluation for completion design optimization

Delivering deeper reservoir insights

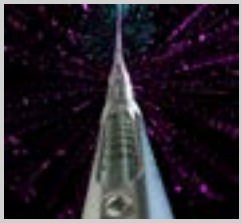
The TRU-ARMS service offers several application-specific workflows that can be selected to run "automated" for well-understood environments. Workflows can also be run "supervised" in complex environments where "automated black box"-type approaches may not provide suitable definition.

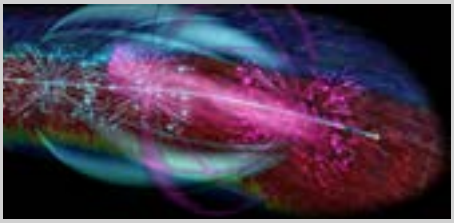
Another unique feature of the TRU-ARMS service is its ability to interrogate the inversion results with dynamic depth of detection tubes as well as resistivity and boundary confidence analysis.

As with any conductive seeking tool, the TRU-ARMS service response depends on formation resistivity contrast. In ideal conditions, remote boundaries can be detected up to 300 ft (91 m) away from the borehole.

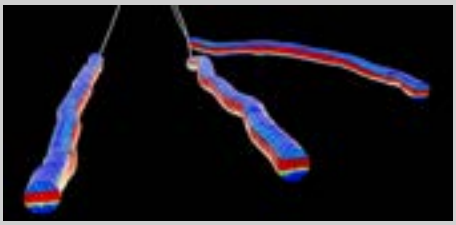
This depth of detection takes interpretation from the borehole to the seismic scale, ushering in a new era in real-time wellbore placement and reservoir mapping.

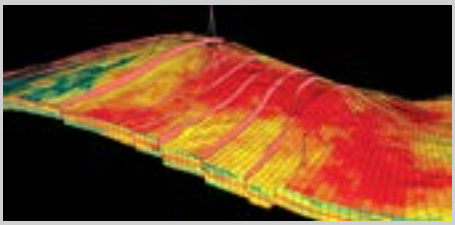
The TRU-ARMS service's innovative antenna design and flexibility in transmitter/receiver placement in the BHA help achieve mapping objectives in all directions, with a higher signal-to-noise for dynamic depth of detection up to 300 ft away from the wellbore.



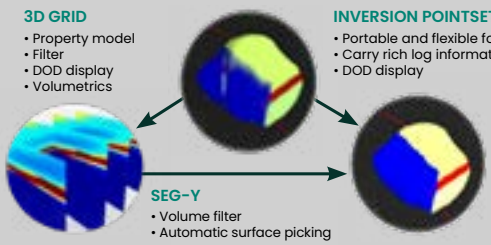


By seamlessly integrating the TRU-ARMS service's rich UDAR datasets into the reservoir model, operators gain sharper insights into reservoir geometry, properties, distribution, and estimates of hydrocarbon volume.

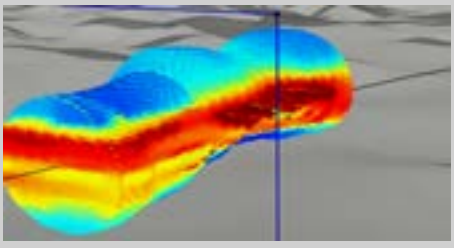




Display versatility and incorporation into subsurface modelling software



Full volume multidimensional inversion



Baker Hughes