

SONICGAUGE™

WIRELESS MONITORING SYSTEM

COMPANY OVERVIEW

Acoustic Data, headquartered in Woking, United Kingdom, is a global leader in wireless downhole communication and command-driven electro-mechanical technology for the Oil & Gas and Underground Energy Storage industries.

Uniquely, the company's proprietary acoustic telemetry systems can be used for real-time downhole data acquisition and equipment command+control across the entire well lifecycle, from Drill Stem Testing SRO to multi-year applications such as Production Optimisation and Barrier Monitoring & Verification.

TECHNOLOGY OVERVIEW

The SonicGauge™ Wireless Monitoring System is a two-way (duplex) acoustic telemetry system that measures and wirelessly transmits wellbore pressure and temperature from downhole to surface in real time.

The downhole gauge systems are ideal for providing bottom-hole and gradient/multi-zone data during the production, injection and monitoring phases of well operation. There is no depth limitation, as SonicRepeater stations can be used to boost the acoustic data packets to surface.

The downhole tools can be mounted on tubing, in the wash pipe or retrofitted through tubing on the Barracuda™ HEX-Hanger™ by slickline. Alternatively, for barrier verification, the SonicGauge can be mounted on the bottom of downhole tools such as retrievable bridge plugs, storm packers and inflatable packers.

Drill Stem Testing SRO

Production Well Testing

Reservoir Monitoring

Artificial Lift Monitoring

Production Optimisation

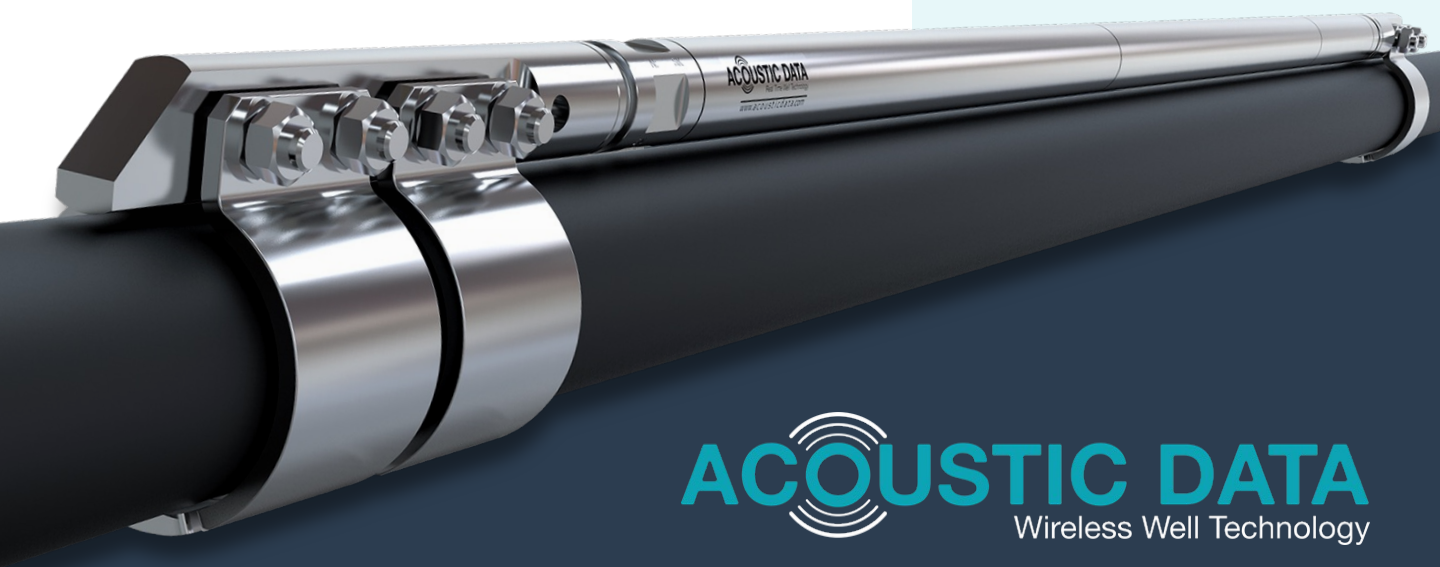
Failed PDG Replacement

P&A | Barrier Verification

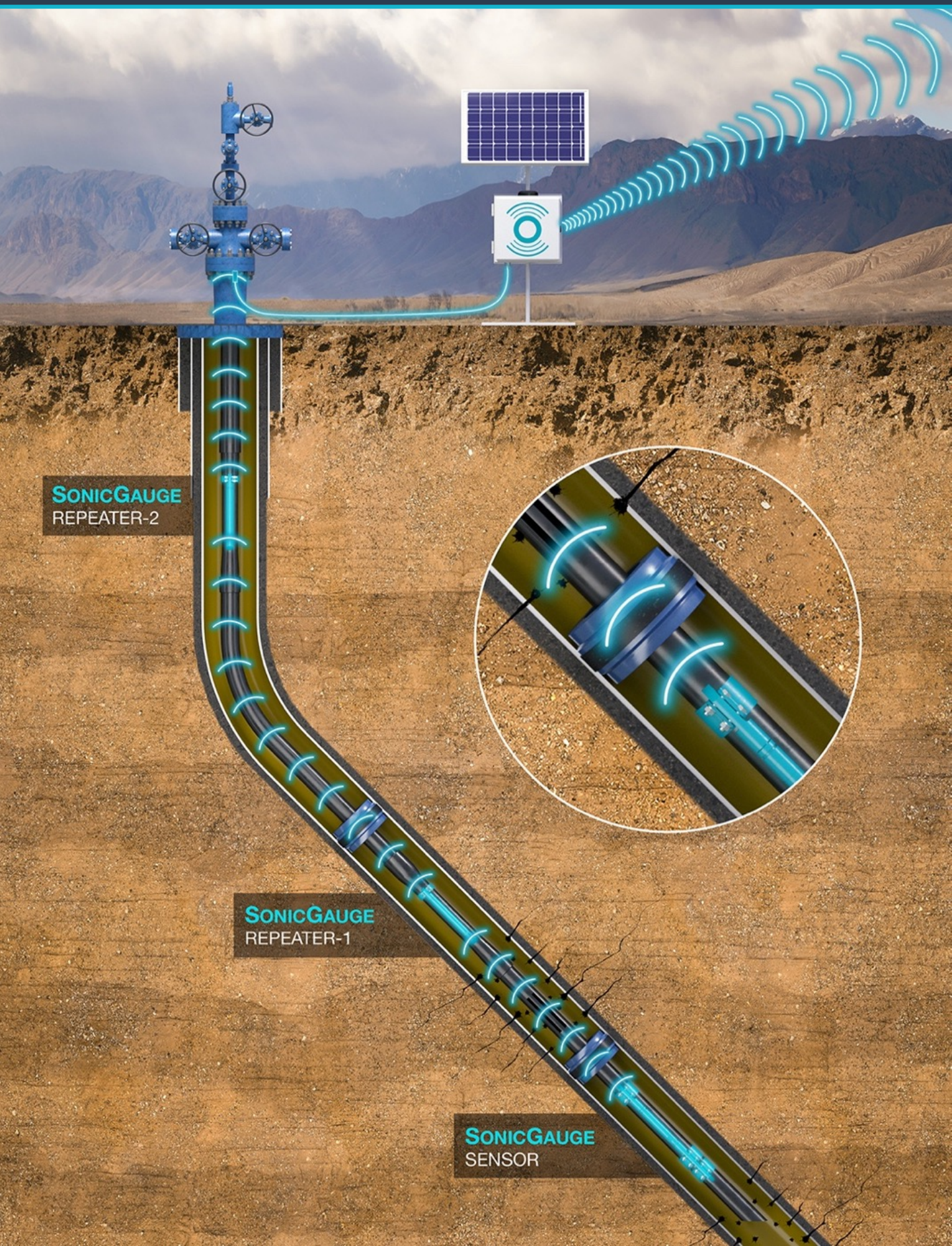
Frac & Gravel Pack Monitoring

Underground Energy Storage
Monitoring

Underground CCS Monitoring



RESERVOIR MONITORING | PRODUCTION OPTIMISATION



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: SOUTH-EAST ASIA

Production Optimisation of Brownfield Developments

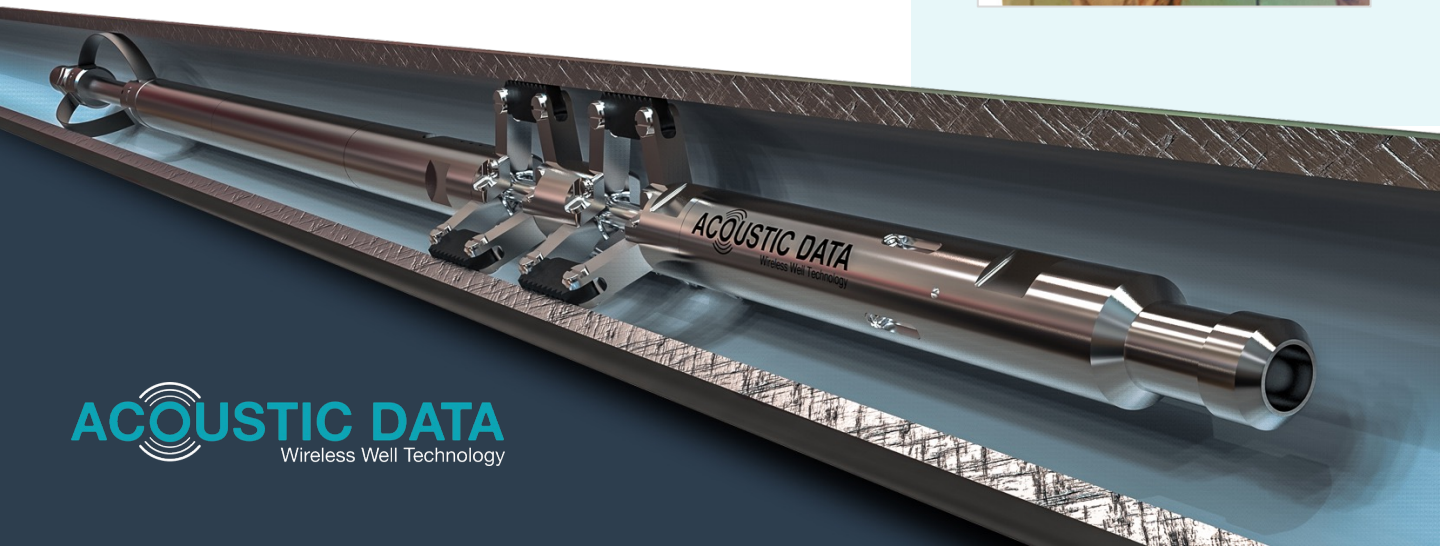
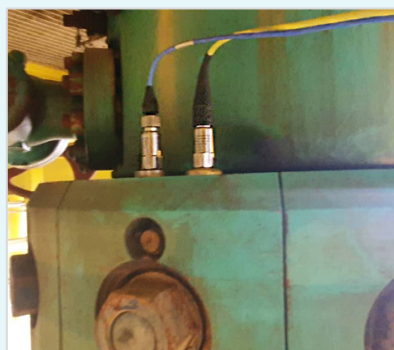
- An NOC is managing an ageing field where the majority of the wells do not have real-time downhole monitoring.
- They require data to manage assets in production decline and fast-track production optimisation initiatives.

SOLUTION

- Acoustic Data's engineers installed a real-time SonicGauge™ Wireless Monitoring System on an offshore platform using a local slickline company.
- The acoustic telemetry system was deployed on Barracuda™ HEX-Hangers that were set in 4-1/2" tubing by the Electro-SET, a battery-powered electronic setting tool.
- The SonicSync™ duplex communication modem was attached to the wellhead to fine-tune the system, start data transmission at a 10-minute rate, and poll the SonicGauge sensor for high-frequency historical BHP/BHT data during a PBU operation.
- After the well was flowed to 10mmscf, the SonicSync changed the data schedule back to a 6-hour data rate in order to deliver up to 5 years of real-time downhole monitoring at 75degC.

RESULTS

- The system was quick to install, and data was immediately sent from downhole to desktop via the platform SCADA system.
- The SonicGauge System is providing daily downhole flowing and shut-in data with no loss of production.
- The operator's future OPEX and carbon footprint have been significantly reduced by displacing memory gauge surveys, which also defer production revenue.



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: IRAQ
PARTNER: NESR

Production Optimisation & Interference Testing of Remote Assets

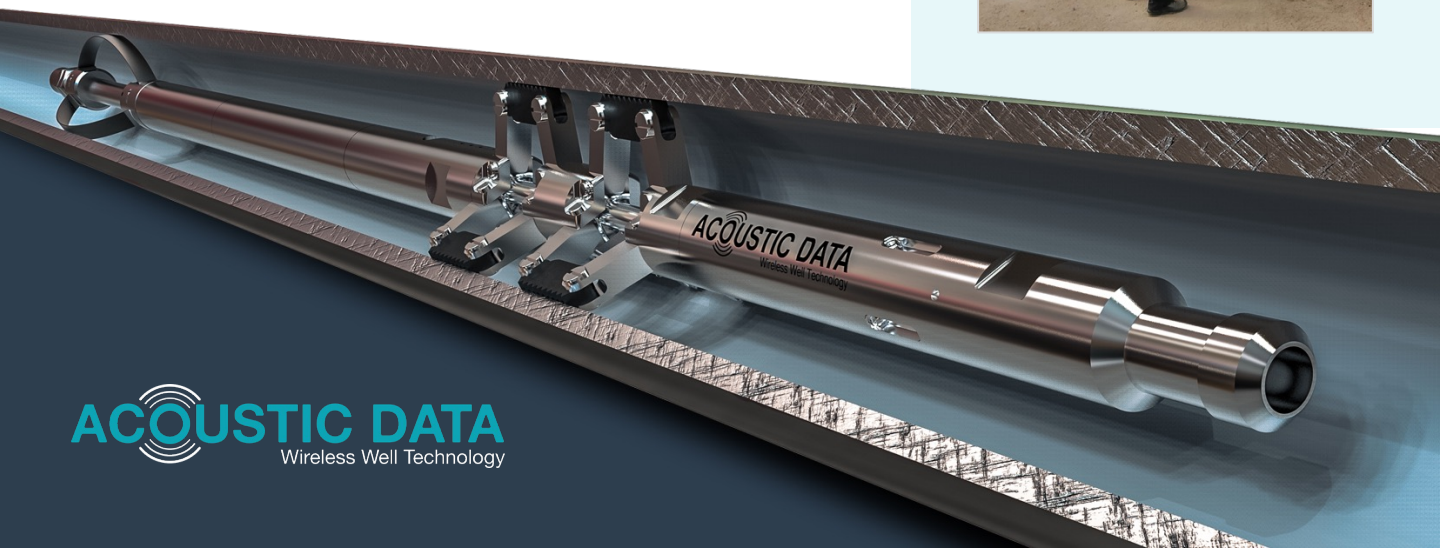
- A consortium of IOCs and local E&P operators are redeveloping a field in Southern Iraq where the majority of the assets do not have downhole gauges for real-time reservoir surveillance.

SOLUTION

- Acoustic Data's engineers mobilised to Iraq to install four SonicGauge™ Wireless Monitoring Systems in conjunction with NESR, who deployed the technology via slickline.
- Downhole tools were installed on Barracuda™ HEX-Hangers that were set in 3-1/2" tubing by the Electro-SET, a battery-powered setting tool activated by an onboard timer.
- SonicGauge sensors were set at 2905mMD, 2735mMD, 2600mMD and 2400mMD, and are operating up to 100°C and 2500psi in these wells.
- SonicRepeater stations were selectively installed to account for production tubing attenuation and to provide real-time gradient surveys.
- The remote nature of the field made traditional methods of data transfer impractical, so Acoustic Data installed 3G/4G modems linked to a cloud-based application to allow the reservoir team to monitor performance 24/7 from anywhere in the world.

RESULTS

- High-frequency BHP/BHT data was immediately sent from downhole to desktop via a remote communications unit, which improved subsurface visibility throughout the field.
- Systems were optimised for a monitoring period of up to 3 years, providing a significant reduction in OPEX and carbon footprint due to reduced well intervention activity (memory surveys).



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: ITALY

Assuring Reservoir Integrity & Regulatory Compliance

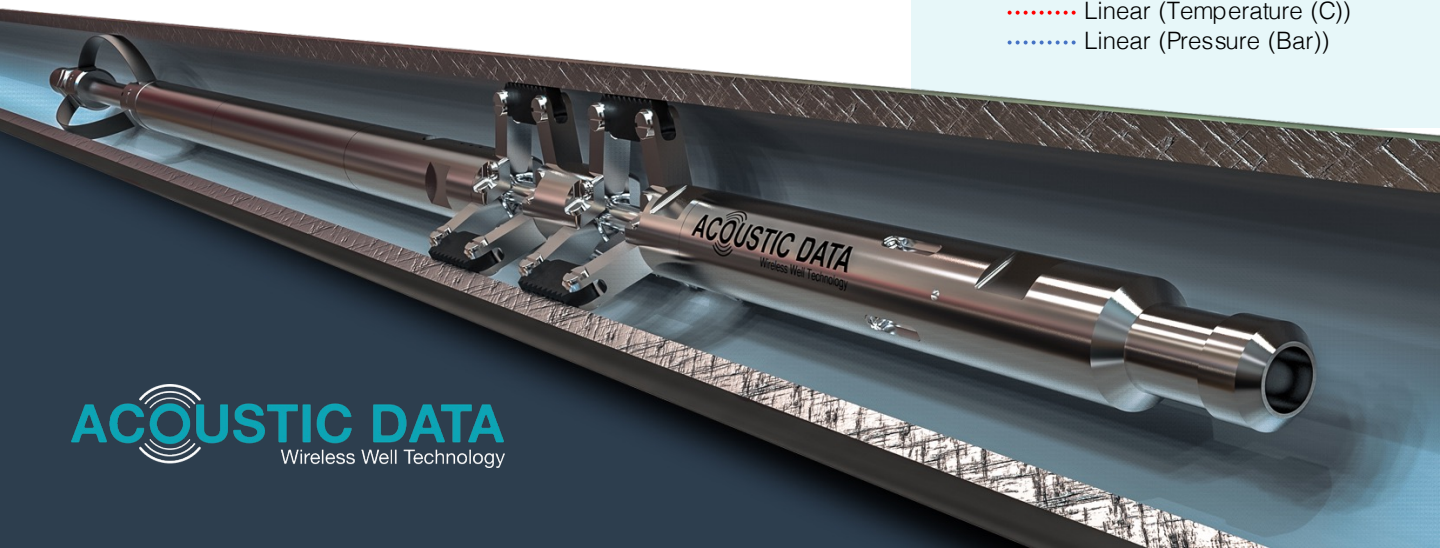
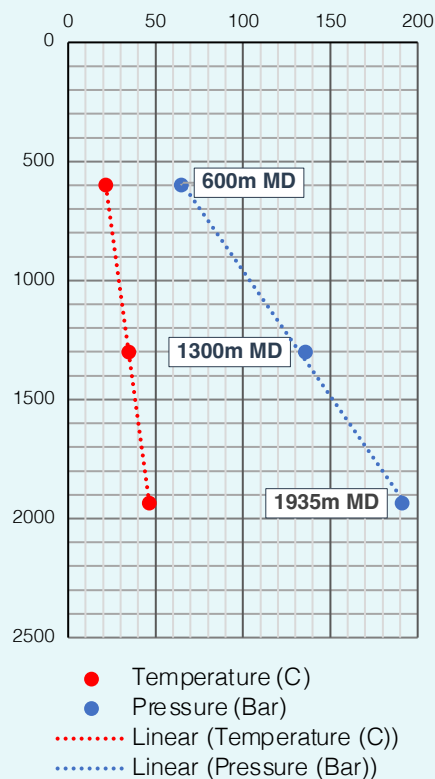
- Governments are increasing regulatory demands for monitoring underground energy storage volume/pressure and confirming caprock integrity on a frequent and long-term basis.
- An EU Operator had multiple wells without real-time monitoring systems, with downhole data for regulatory reporting being obtained via frequent memory gauge surveys at significant cost.

SOLUTION

- The SonicGauge™ Wireless Monitoring System was retrofitted via slickline in 2-3/8" tubing on Barracuda™ HEX-Hangers.
- The primary SonicGauge sensor was located at 1,935mMD (6,346ft), and SonicRepeater stations with onboard sensors were installed at 1,300mMD (4,264ft) and 600mMD (1,968ft).
- A 4G-WiFi Data Logger was installed at surface to provide the data transfer from the wellhead to the operator's desktop.

RESULTS

- Upon installation, the SonicGauge System transmitted high-resolution and high-accuracy real-time downhole data to surface every 10 minutes.
- The data schedule then transitioned to hourly intervals to provide dynamic injection and production pressure gradients for a period of 2.4 years, after which, the system would be retrieved, redressed, and redeployed for a further 2.4 years.
- The SonicGauge provided multi-year data acquisition to comply with regulatory reporting, significantly reducing well intervention OPEX (memory gauge surveys), and it removed the workover cost related to installing a cabled PDHG.



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: AUSTRALIA

Low-Profile Technology Enables Real-Time Monitoring of PCPs in CSG (Snubbing Unit Deployed)

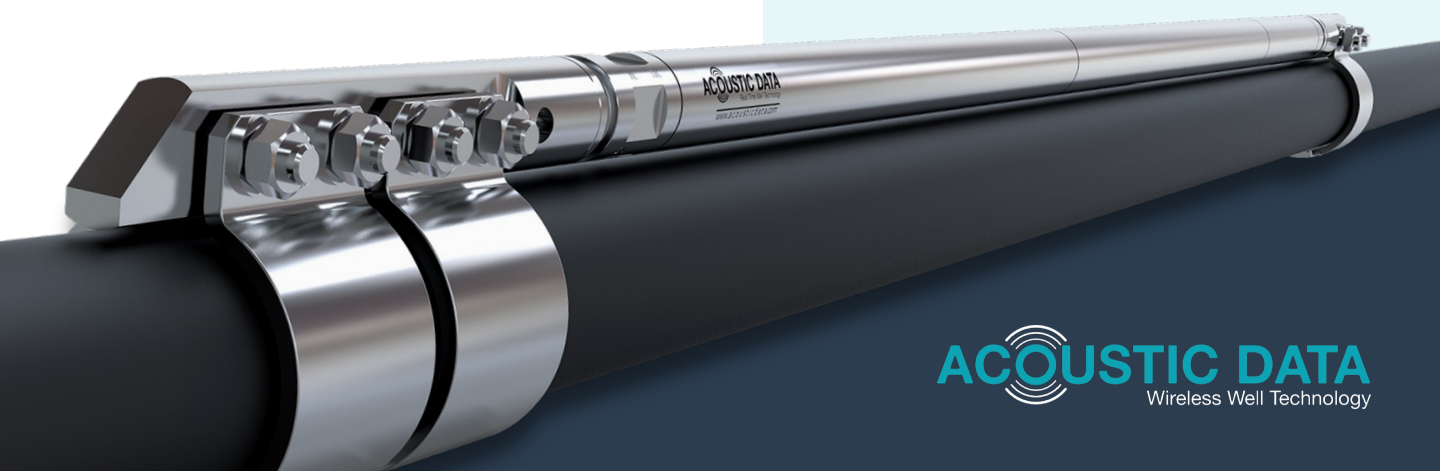
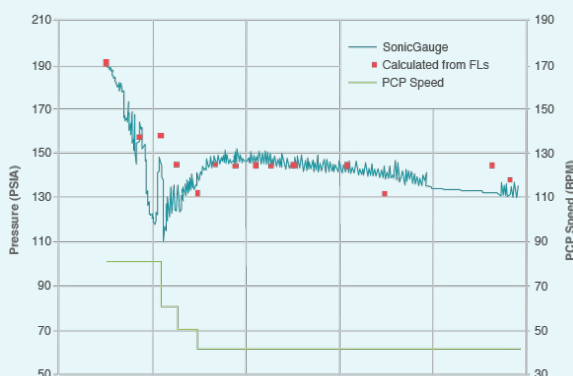
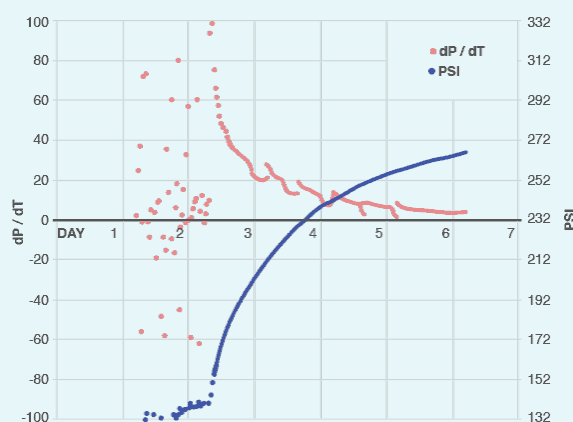
- Real-time annulus fluid level data was required at frequent intervals in two PCP wells for approximately one year to ensure the wells were not pumped off, and to capture pressure build-up data between pumping cycles.
- The client required a cost-effective cable-free solution that didn't require any modifications to the wellhead and could be deployed using a snubbing unit on a live well.

SOLUTION

- An Acoustic Data engineer installed the SonicGauge offline on external clamps before the tubing was run, saving significant rig time.
- In one well, a single SonicGauge was installed at 239mMD, and in the other well at 316mMD—both were located directly underneath the PCPs.

RESULTS

- The two SonicGauge Systems operated without fault for their entire deployments.
- The hourly frequency of data acquisition allowed the operator to accurately monitor the 'real' dynamic fluid head over the PCP during the dewatering phase and to capture early well pressure build-up parameters.
- The graph to the right compares consistent wellbore pressure provided by the SonicGauge against the 'scattered'/periodic wellbore pressures estimated by echo-meter shots.



BARRACUDA™

HEX-HANGER™

LOCATION: PERMIAN BASIN, USA

Cost-Effective Deployment of Downhole Devices in Completion Sizes From 2-3/8" to 13-3/8"

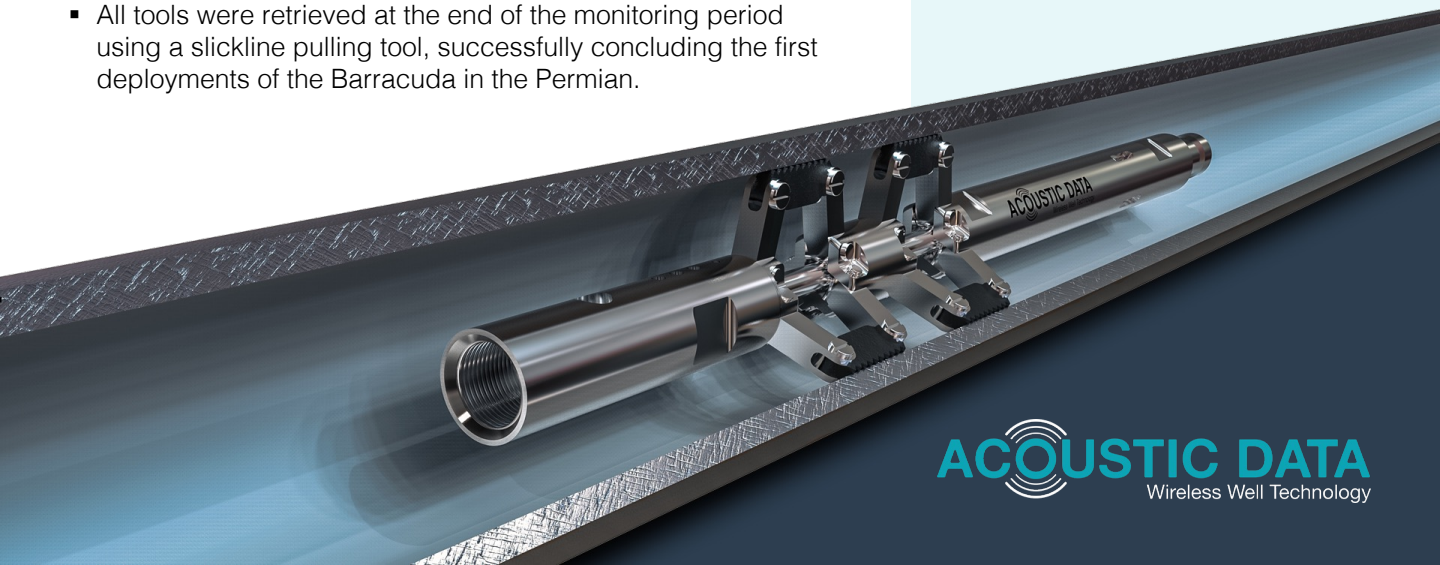
- Memory gauges provide operators with an economical method of recording downhole well conditions over extended periods. However, traditional deployment methods restrict users to pre-existing nipple profiles within the completion.
- In a recent suite of operations in the Permian Basin, a well operator wanted to record the early-stage production of a series of recently drilled wells without incurring high costs, which would have limited the program scope.
- The monobore completion precluded the use of lock mandrels, leaving the team to search for a reliable and cost-effective high-expansion solution.

SOLUTION

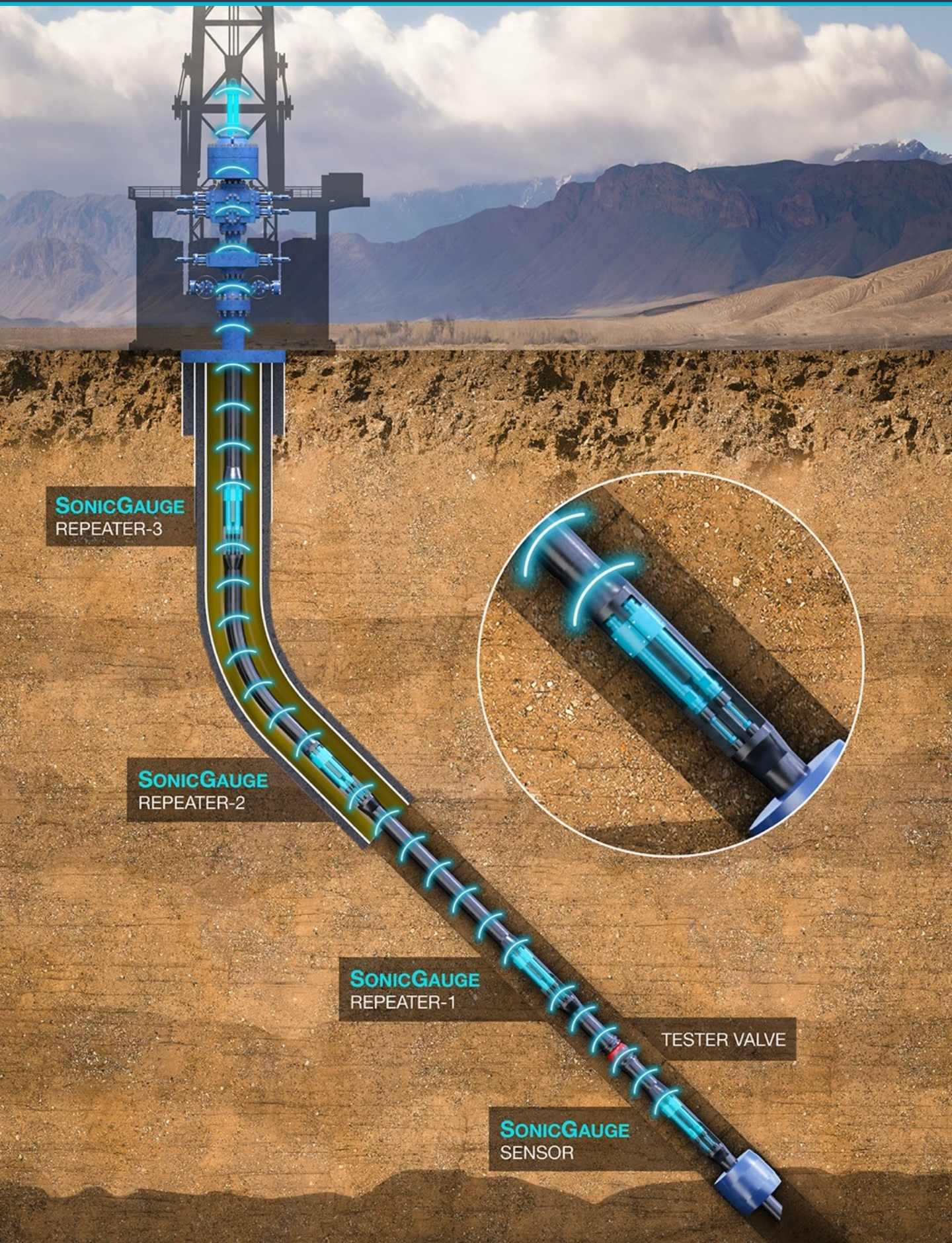
- An Acoustic Data engineer utilised the Barracuda HEX-Hanger to deploy memory gauges in six wells back-to-back, using a local slickline provider.
- The Barracuda product line includes the Electro-SET, an electro-mechanical setting tool, which minimises toolstring length due to its compact size (OD: 48mm, Length: 800mm), uses standard rechargeable batteries, and has onboard memory to confirm each run has been executed successfully.
- The innovative design minimises run costs, is deployed using standard slickline components, and has been used to install SonicGauge Systems over 150 times in the last few years.

RESULTS

- Memory gauges were installed in 5-1/2" 20 lb/ft P100 casing at ~2,650m (~8,700ft) with no lost time or HSE incidents.
- All tools were retrieved at the end of the monitoring period using a slickline pulling tool, successfully concluding the first deployments of the Barracuda in the Permian.



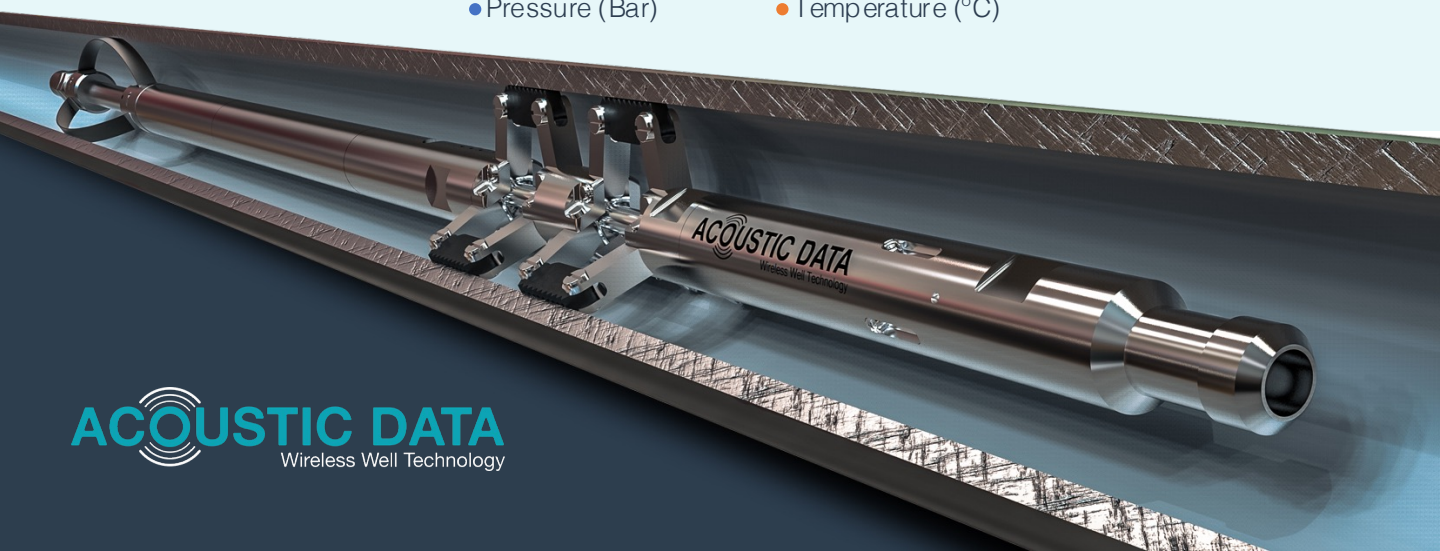
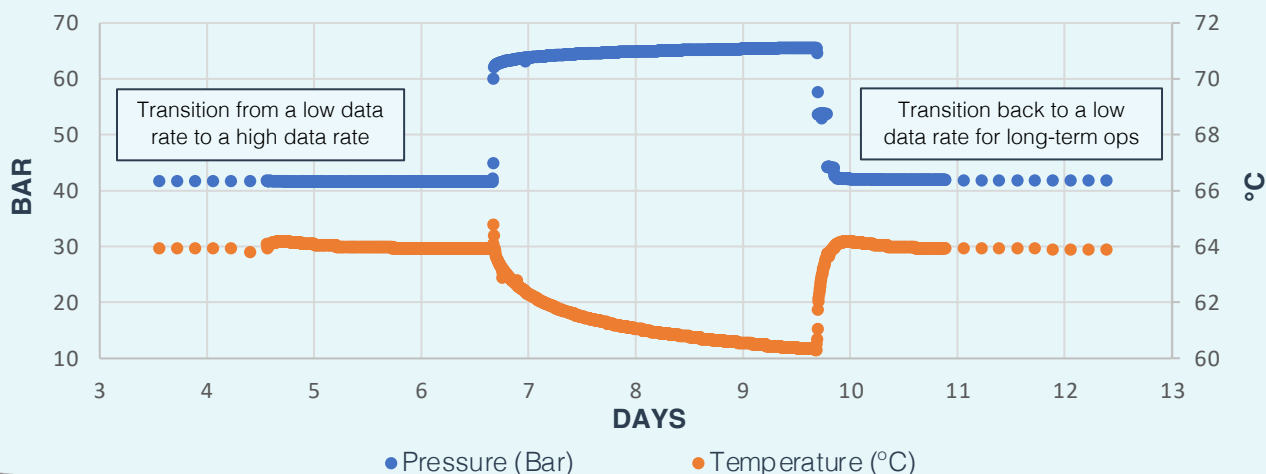
DRILL STEM TESTING | PRODUCTION WELL TESTING



High-Frequency Production Well Testing Combined With Multi-Year Reservoir Surveillance

- The SonicGauge™ affords users the ability to change data delivery rates of downhole tools, switching from long-term reservoir surveillance to high-rate well-testing modes, using the SonicSync™ duplex communications modem.
- On a recent operation for a super major in the Asia-Pacific region, the reservoir team required an annual Pressure Build Up test to be carried out from a system installed by slickline a year before. The operation would require a high-frequency data schedule to be programmed to the downhole tools, and the system would need to deliver best-in-class data recovery rates.
- The robust nature of the SonicSync allows for commands to be sent to downhole tools whilst the well was flowing, eliminating the requirement for the well to be shut in (saving production revenue) and shortening the time required for the overall operation (saving rig time).
- The graphic below shows the transition between data rates at the start and end of the test, and the overall data recovery rate was >97%, which is exceptional for a retrofitted real-time system.

PRESSURE BUILD-UP TEST



Real-Time SRO Data Enables Subsurface Visibility of PBU, Saving Rig Time

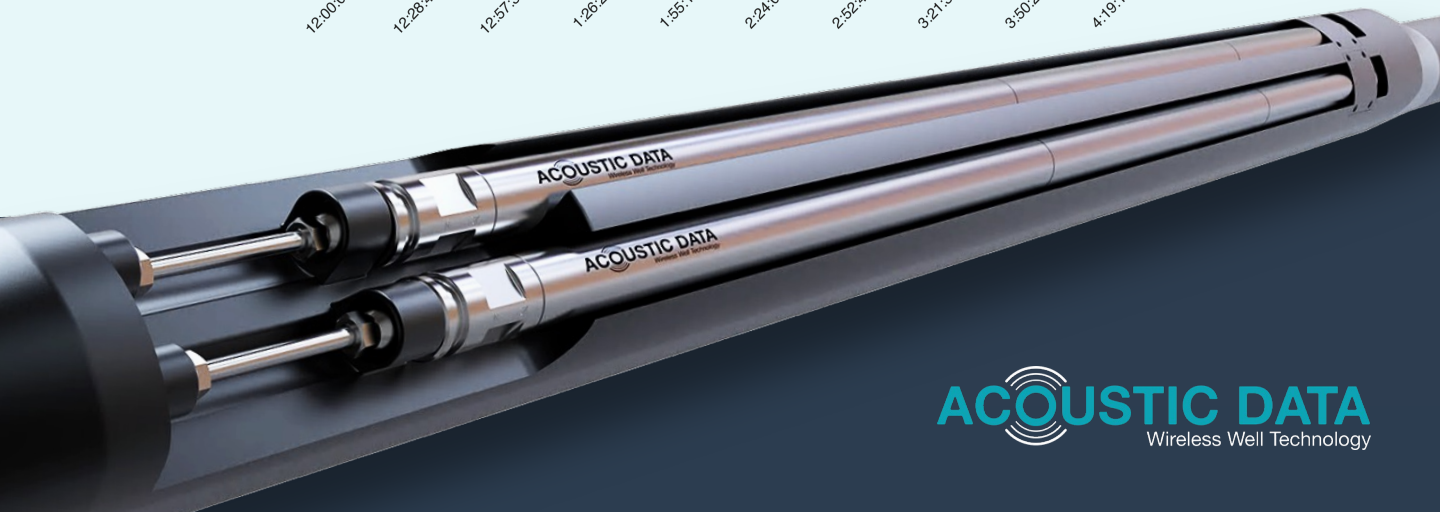
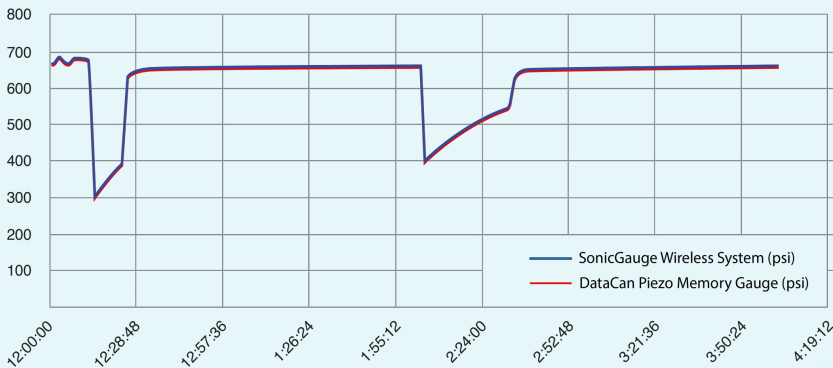
SOLUTION

- The SonicGauge™ Wireless Monitoring System was deployed in a drilling campaign in Australia to support DST operations by providing real-time surface read-out (SRO) of downhole data during shut-in and flowing conditions.
- The operator requested a real-time acoustic telemetry system as other technologies, such as EM, were unable to provide reliable data acquisition for their operations.
- High-frequency data was required over several hours of testing to capture pressure build-up and drawdown characteristics.

RESULTS

- Real-time 1-minute data was recovered to surface from the SonicGauge System from depths up to 1914mMD.
- When the SonicGauge data was compared to data retrieved from the DataCan 3/4", 6,000psi piezo gauges that were run on the inside of the DST string, there was an exact overlay.

OPERATION	MD
Cooper Basin	1914m
Surat Basin	692m
Surat Basin	564m
Surat Basin	503m
Surat Basin	628m
Surat Basin	498m
Surat Basin	481m



SONICANALYST™

DOWNHOLE EVENT MONITOR

LOCATION: CANADA

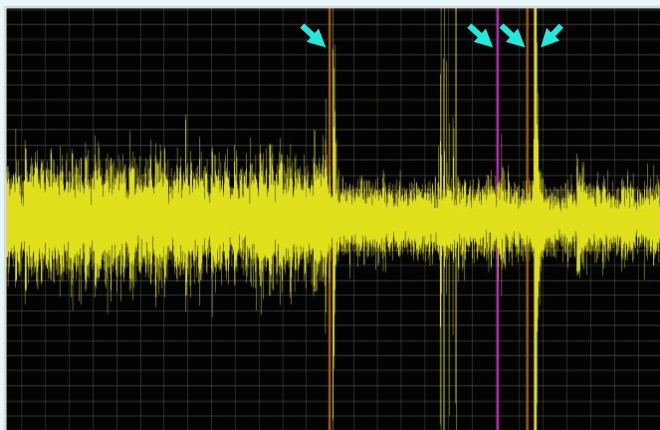
Real-Time Acoustic Monitoring at Surface Saves O&G Company \$300,000 in Failed Frac Costs on Critical Operation

OVERVIEW

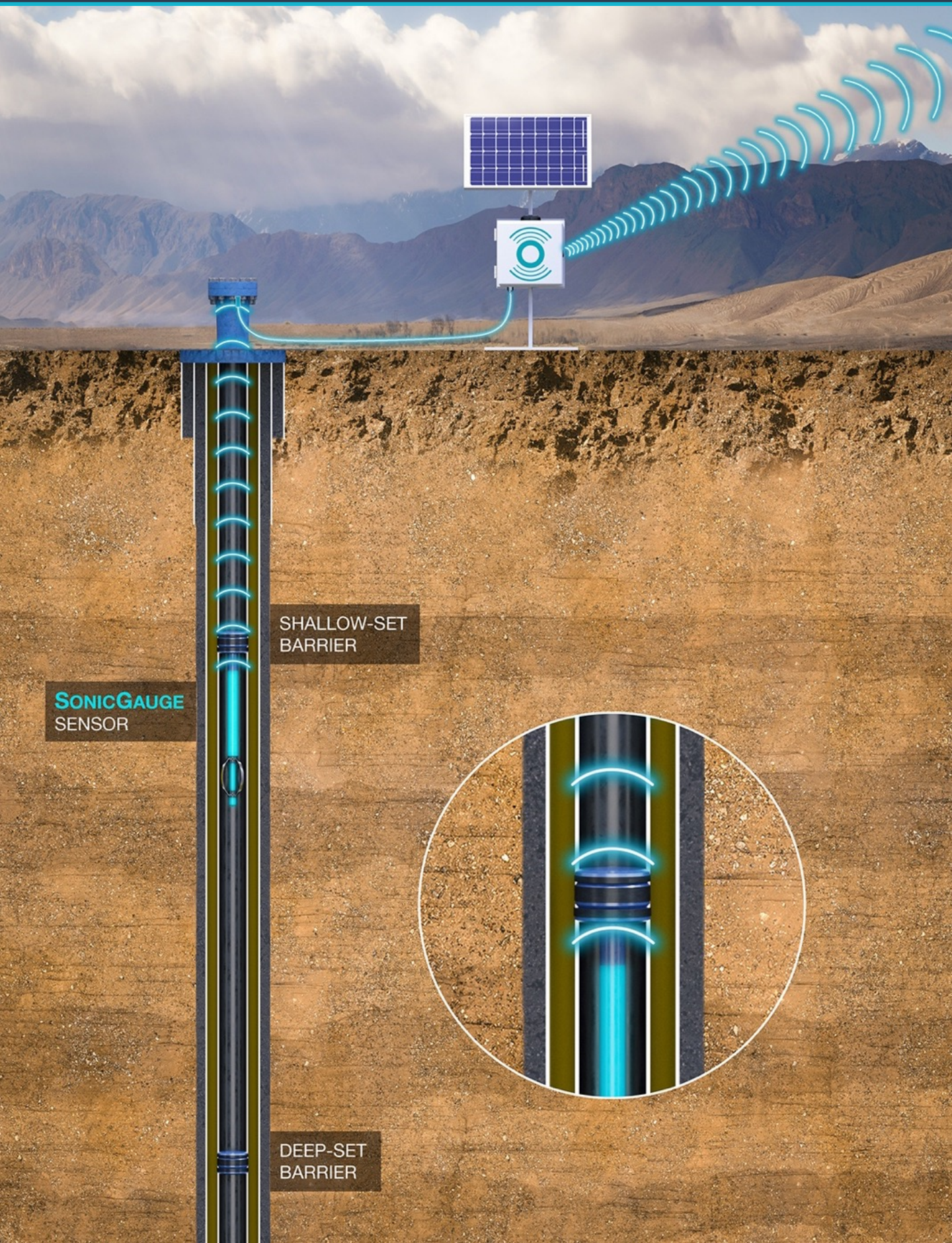
- During fracture stimulation treatments, the SonicAnalyst™ Downhole Event Monitor provides positive confirmation of frac ball launch and seating, movement of sliding sleeves, and changes of fluid flow noise indicating frac fluid diversion or breakthroughs.
- It provides positive confirmation and the exact time when perforation guns have been fired downhole, which is particularly useful if phased perforating timing is used.

SOLUTION

- During a SonicAnalyst deployment, the operator was able to identify a missed ball launch at surface that would have resulted in a sleeve not shifting and a frac not being diverted as required.
- They were able to reset the equipment and complete a successful frac after the SonicAnalyst technology had identified the fault at surface.
- The operator estimated that the information saved them US\$300,000 in failed frac costs.
- Four distinct operations and their noise signals can be seen in the image below, which were identified through the SonicAnalyst monitor's downhole noise filtering and interpretation technology.



P&A | BARRIER MONITORING & VERIFICATION



SONICGAUGE™

BARRIER VERIFICATION SYSTEM

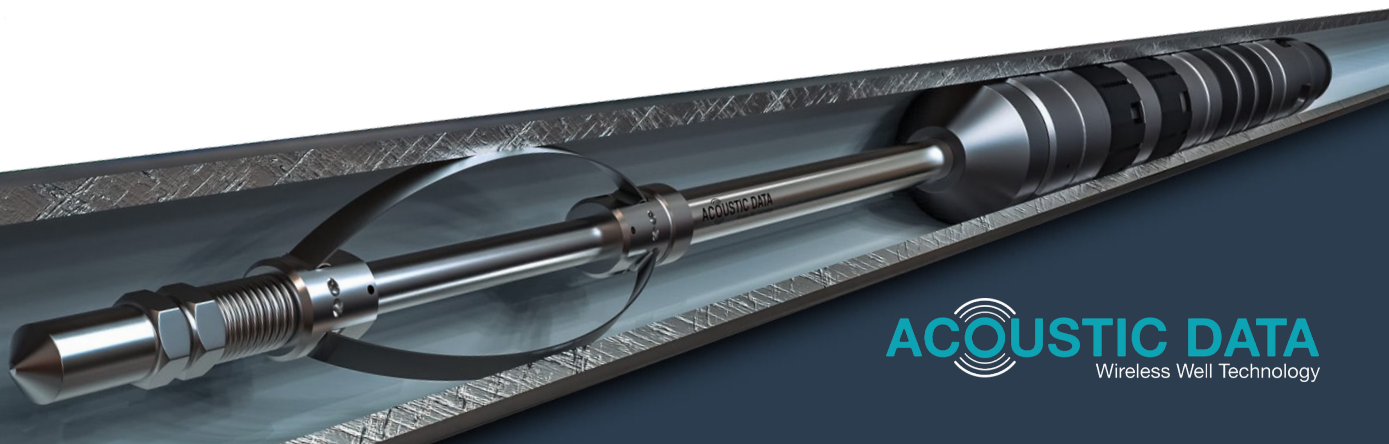
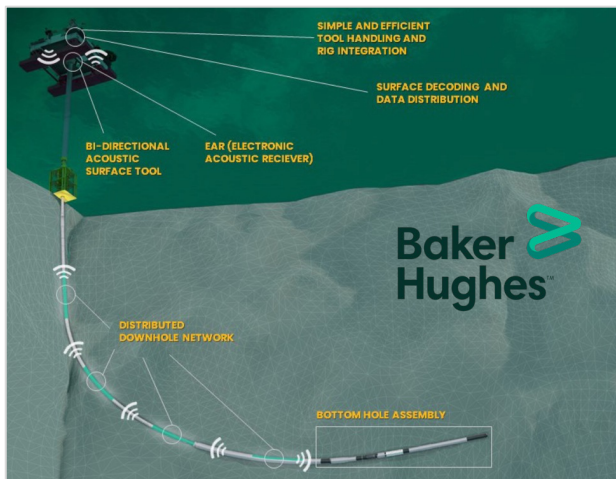
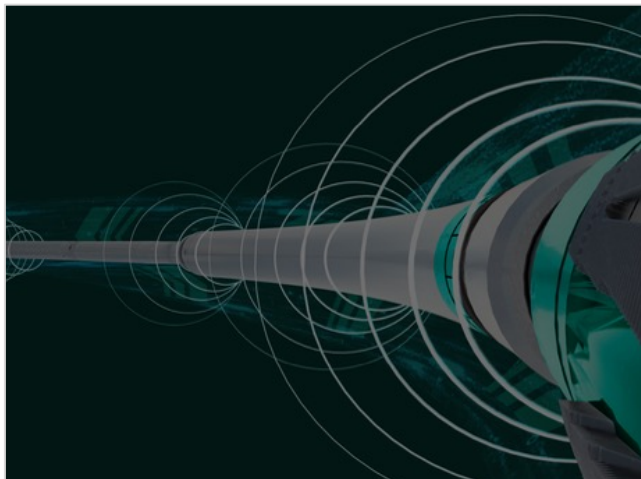
LOCATION: GULF OF MEXICO
PARTNER: BAKER HUGHES

Monitoring Suspended Well in the Gulf of Mexico & Assuring Barrier Integrity at 8,450m (27,500')

- Acoustic Data's SonicGauge™ Barrier Verification System is a versatile application of real-time wireless technology that has been used to assure the safety of crews during short-term interventions as well as enable long-term monitoring of suspended wells, such as a recent operation in the Gulf of Mexico.
- The SonicGauge is ideally suited to support intervention operations such as wellhead changeouts or maintenance where temporary barriers, such as plugs, have to operate correctly to ensure crews can operate safely.
- Acoustic telemetry can traverse plugs, packers, and most downhole completion components, so it is able to relay pressure data directly to surface from beneath shallow set plugs or to wireline/slickline/tubing deployed tools for the monitoring of deeper set barriers (such as in the GOM case at 27,500' / 8,450m).
- The SonicGauge is a field-proven technology which reduces operational risk and meets the industry need for both short- and long-term barrier monitoring.

OTHER SOLUTIONS

- Acoustic Data and Baker Hughes have commercially deployed the combined SonicGauge-XACT acoustic telemetry solutions in the Gulf of Mexico with several IOCs for applications, such as frac pack and gravel pack monitoring.
- Please enquire with our team for more information.



SONICGAUGE™

BARRIER VERIFICATION SYSTEM

LOCATION: GERMANY
PARTNER: MULTILINE

Real-Time Assurance of Barrier Integrity on Safety Critical Operations

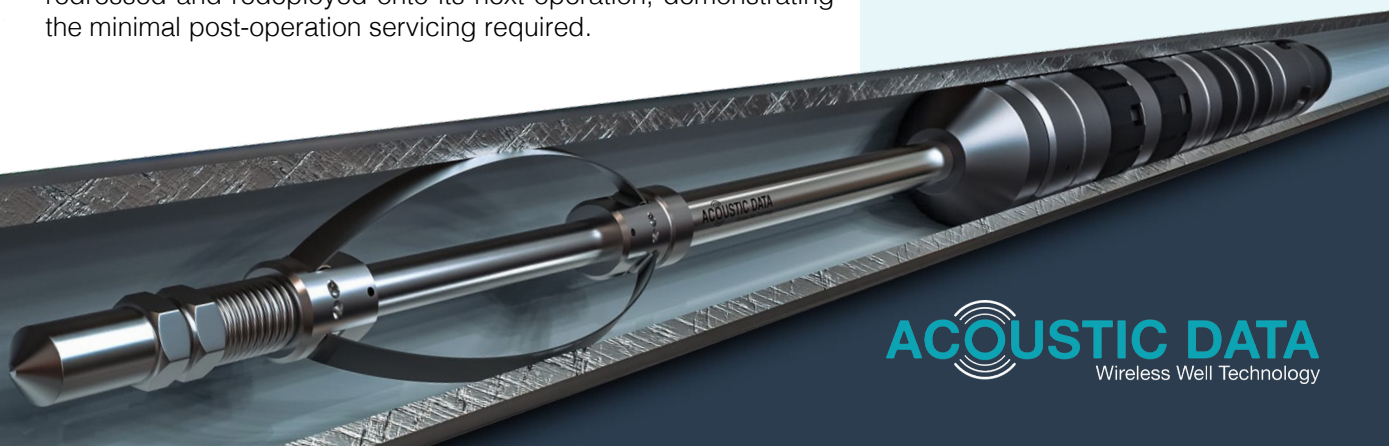
- All intervention operations present hazards; however, operations in salt caverns utilised for underground gas storage (UGS) present additional challenges due to the inability to utilise many traditional well control measures if containment is lost.
- In a recent operation to replace a seal between the wellhead and the xmas tree, a European operator needed to ensure that the barrier provided by two wireline retrievable bridge plugs was maintained throughout the operation.
- Any degradation in the performance of the plugs would need to be immediately detected to permit the intervention team to take remedial actions.

SOLUTION

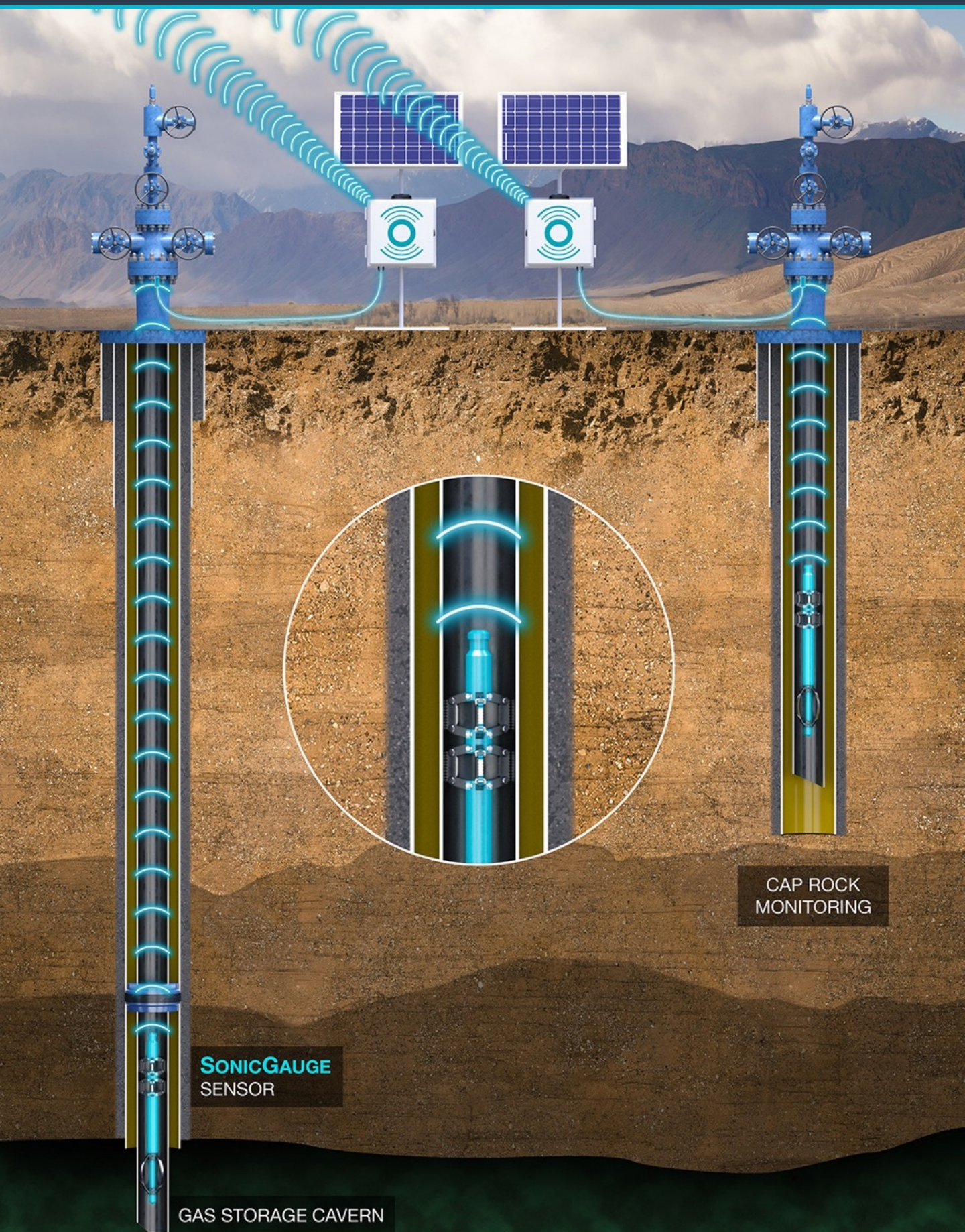
- Acoustic Data's engineers installed a SonicGauge™ BVS, which permits real-time monitoring of the integrity of downhole barriers.
- The SonicGauge transmitted data every 2 minutes, allowing the surface data logger to continuously monitor BHP/BHT and activate user-defined alarms in the event of any variations in downhole conditions.
- The technology can be configured for short- or long-duration deployments, from a few hours to several years, and leverages our expertise in wireless downhole monitoring of critical assets.
- The SonicGauge can be deployed as part of the plug assembly, independently on the Barracuda™ HEX-Hanger or integrated into components such as wash pipes to allow the continuous monitoring of any downhole completion.

RESULTS

- The intervention team were able to execute the operation with the assurance that the subsurface barriers were holding pressure throughout the seal changeout.
- The SonicGauge BVS was retrieved at the end of the operation, redressed and redeployed onto its next operation, demonstrating the minimal post-operation servicing required.



UNDERGROUND ENERGY STORAGE



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: GERMANY
PARTNER: MULTILINE

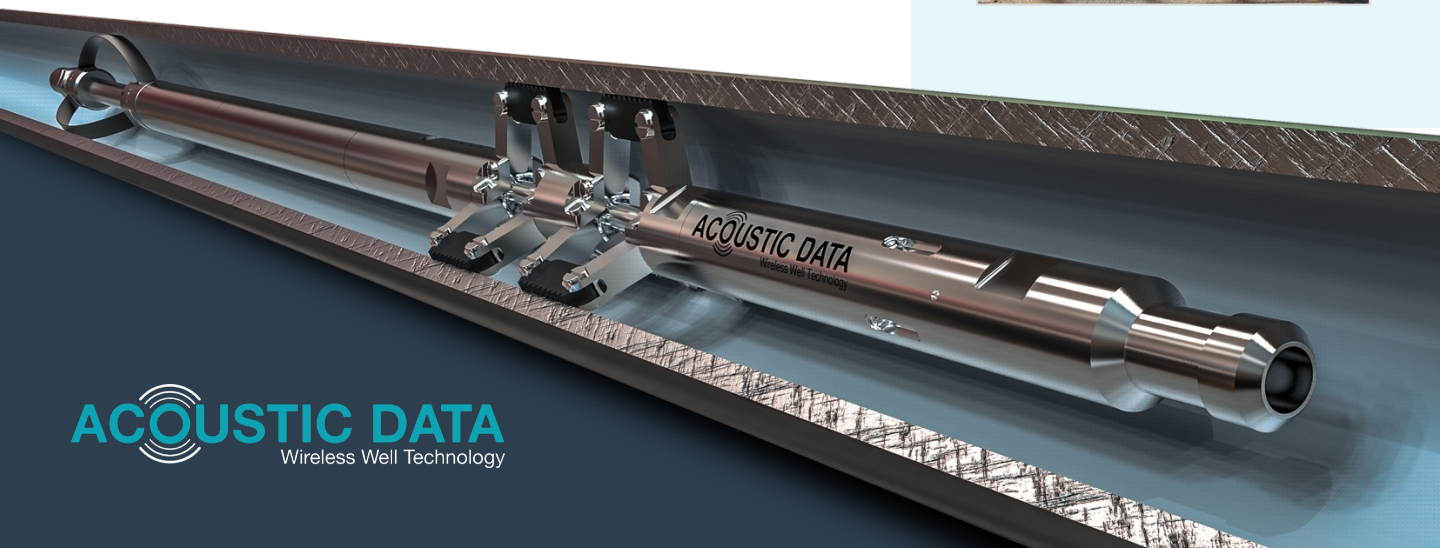
Four SonicGauge Systems Retrieved & Re-Run With Zero Lost Time or Safety Incidents

OVERVIEW

- In late 2023, a major European Gas Storage Operator wanted to retrieve and redeploy four SonicGauge Systems installed in 2020 to monitor a new set of injector/producer and observation wells as part of their periodic well maintenance program.
- Since their first installation, the wireless technology has provided continuous real-time pressure and temperature data to assist the operator in monitoring reservoir integrity and optimising production operations over a multi-year duration.

SOLUTION & RESULTS

- The retrieval operation was executed by a slickline crew from Multiline GmbH, who have partnered with Acoustic Data on multiple operations since 2019. A standard SB Pulling Tool was used to retrieve all tools without issue.
- The reinstallation operation was executed flawlessly with the Barracuda HEX-Hanger, enabling all runs to be completed well within the planned time, which allowed for additional slickline operations to be undertaken.
- The ability to retrofit the SonicGauge into any well allows deployment into existing fields, and the range of tubing sizes serviced, from 2 3/8" to 9 5/8", has enabled real-time data to be acquired in observation wells and high-rate injectors/producers.
- The flexibility of the wireless monitoring system has also allowed it to be installed beneath Multiline's Retrievable Bridge Plugs to verify the barrier's integrity during operations such as Xmas Tree changeouts.



High-Rate UGS Asset With Large Bore Completion Design Retrofitted With Real-Time Data Acquisition System

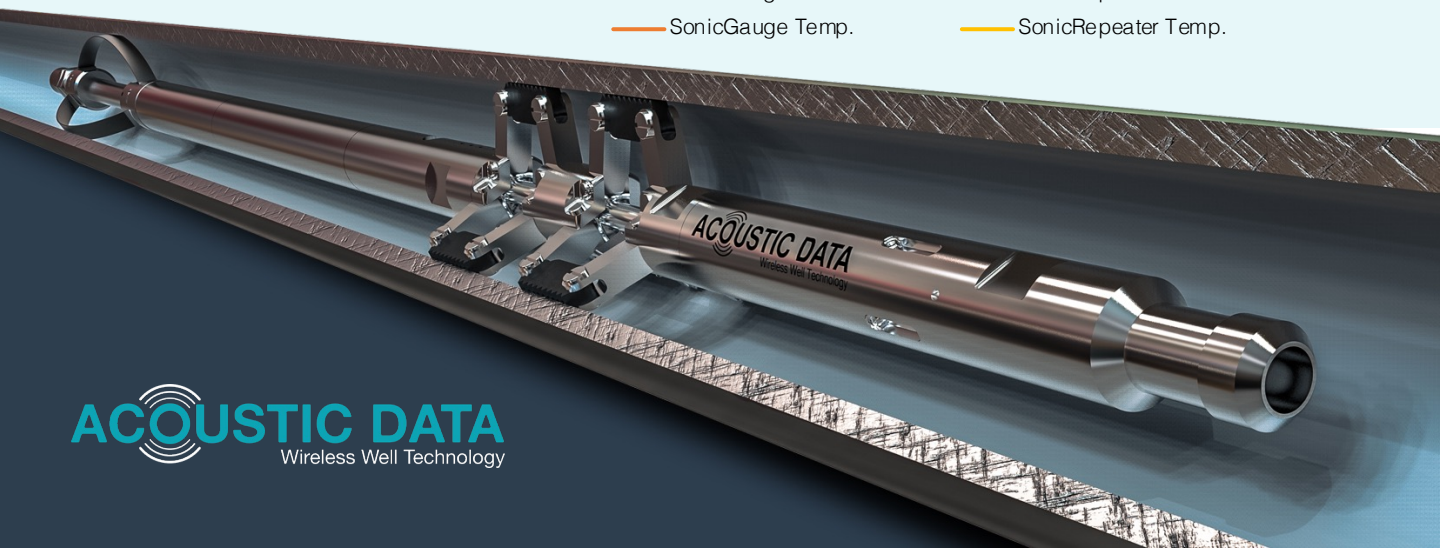
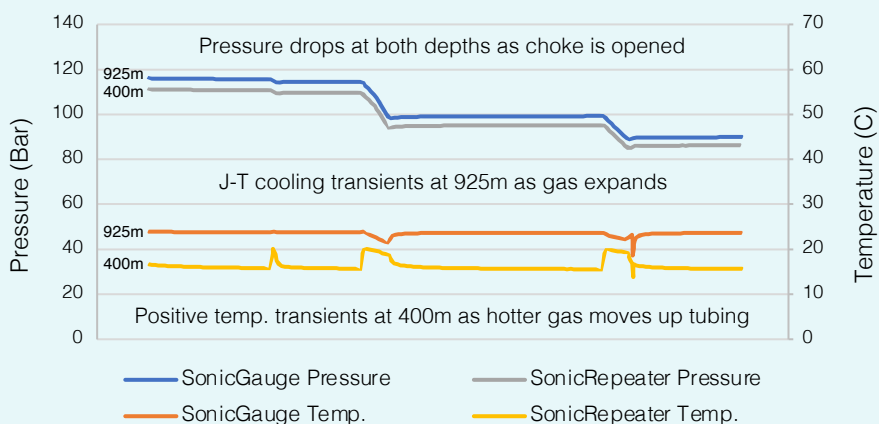
- Downhole pressure and temperature monitoring of gas storage wells provide operators with the basis for accurate material balance and fluid level calculations.
- The goal was to provide the operator with reliable pressure and temperature data in dramatically fluctuating injection and production flow regimes. The solution had to provide real-time data acquisition that cost less than the cost of running and pulling memory gauges with slickline every 3 months.

SOLUTION

- Acoustic Data retrofitted a SonicGauge™ System through 7" tubing on the Barracuda™ HEX-Hanger.
- The SonicGauge was deployed at 925mMD, and a SonicRepeater was then installed at 400mMD to provide assurance that downhole data would be transmitted to surface during future injection and production operations.

RESULTS

- Real-time data was acquired during high injection and withdrawal rates (35mmscf) with single-hop communication achieved from 925mMD (3,034ft) to surface.
- The system has been programmed to deliver 6 years of real-time data acquisition, which has reduced well interventions by up to 20x, and a workover to install a cabled downhole gauge was avoided.



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: USA

Real-Time Monitoring Removes The Requirement for Memory Gauge Surveys

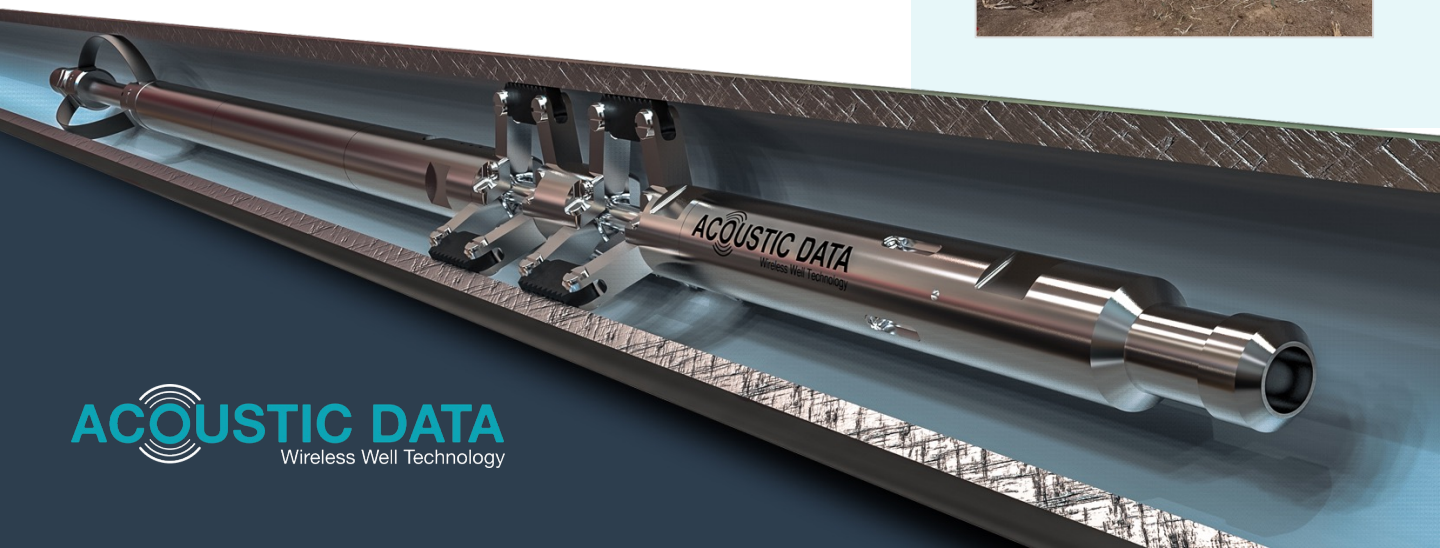
- Underground Gas Storage (UGS) assets are critical to energy infrastructure in enabling energy companies to balance volatility in supply and demand.
- UGS operators will utilise depleted reservoirs and caverns, leveraging existing infrastructure that may have been installed decades earlier, for injection/production as well as monitoring the integrity of the reservoir.

SOLUTION

- Acoustic Data recently completed a second SonicGauge™ installation for a major US operator who required real-time monitoring of an asset, without incurring the cost of a well intervention or frequent operations required with memory gauge surveys.
- The 2-3/8" tubing utilised in the well also required a solution where all downhole equipment, including settings tools for the high expansion gauge hanger, could easily pass through a 1.9" restriction.

RESULTS

- The SonicGauge was selected on the basis of its ease of deployment (slickline deployable Setting Tool with max. OD of <1.88") and integration into existing wellsite communication systems as well as its exceptional power management, enabling gauges to deliver multiple data samples per day with 5-year battery life.
- The small cross-sectional area (best in class) makes the SonicGauge the ideal choice for applications where space is limited or where traditional solutions cannot be deployed.



SONICGAUGE™

WIRELESS MONITORING SYSTEM

LOCATION: UK

High-Rate UGS Caverns With 9-5/8" Tubing Optimised With Slickline Retrofittable Technology

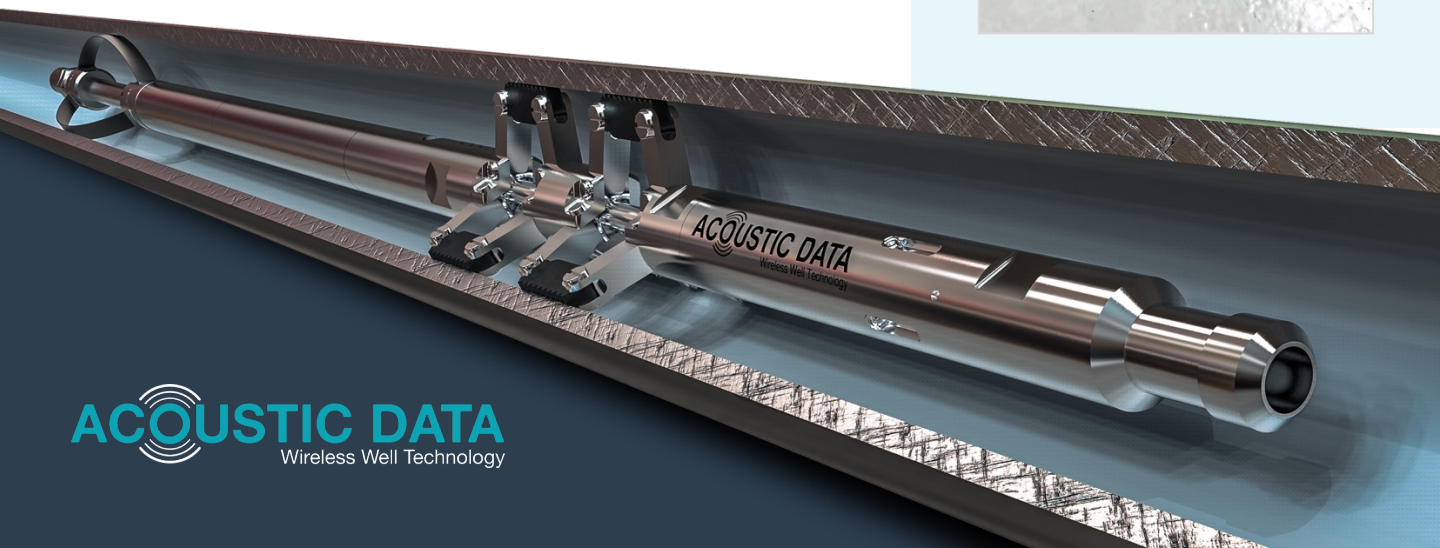
- Gas storage operators need to be responsive to changes in the wholesale gas market to optimise the return on their assets, and accurate downhole data is critical to understand the potential capacity available for storage/sale whilst ensuring the integrity of the cavern is maintained.
- In this case, the operator needed a real-time data acquisition system that could be retrofitted into an existing asset. An added complexity of UGS caverns is the inability to use traditional well control methods in the event of an emergency, so the solution could not modify the surface equipment.

SOLUTION

- The Barracuda™ HEX-Hanger set a single SonicGauge™ sensor at ~260m in 9-5/8" tubing, using a local slickline provider.
- The SonicGauge transmitted data directly to surface, with no requirement for modifying the surface equipment. The surface sensor is rated for Zone-1 hazardous areas and is attached to the wellhead using a magnet.

RESULTS

- The SonicGauge was installed with no lost time or HSE incidents.
- The system delivers real-time data 24/7 throughout the injection/production cycle, optimising operations and assuring cavern integrity.
- The SonicGauge was recently retrieved, redressed and re-run via slickline and is operating on the same data frequency.





AcousticData.com

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