



INTEGRATE DRILLING TECHNOLOGIES TO SAFELY REACH TD AND MAXIMIZE RESERVOIR EXPOSURE

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FACTORS THAT AFFECT YOUR BOTTOM LINE



~~COST PER FOOT DRILLED~~



COST PER BARREL PRODUCED



**INCREASE DRILLING
EFFICIENCY TO
REDUCE COST**



**INTEGRATE THE OPTIMAL
TECHNOLOGIES TO MAXIMIZE
YOUR RECOVERY FACTOR**

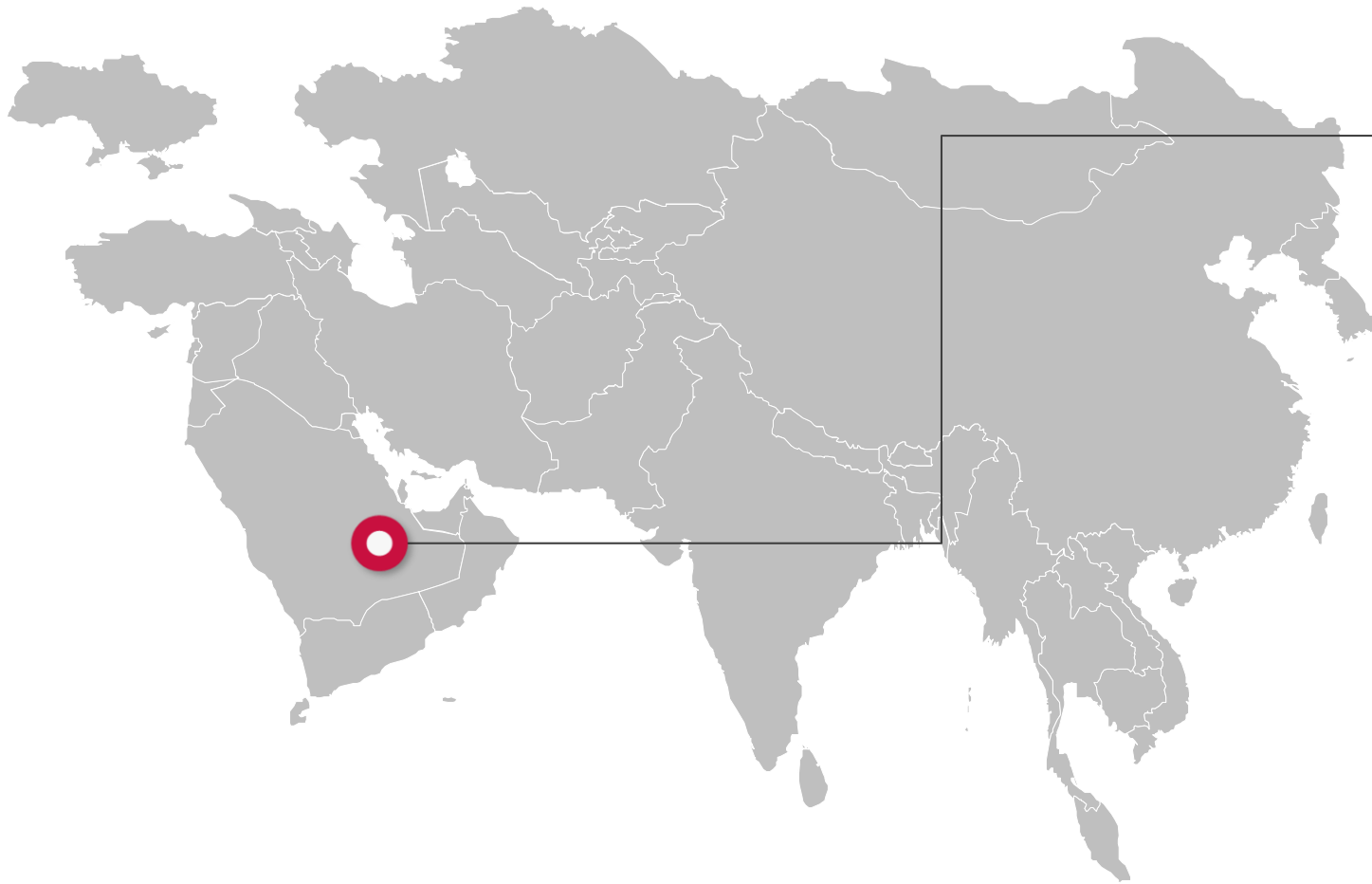


**ENHANCE GEOLOGICAL
CERTAINTY FOR PROACTIVE
DECISION MAKING**

Building solutions with a holistic approach



GEOSTEERED IN PAY ZONE ONLY 5-FT (1.5-M) THICK



KINGDOM OF SAUDI ARABIA

RSS and LWD Solution

High-res image acquisition in oil-based mud helped to stay within the target zone offshore

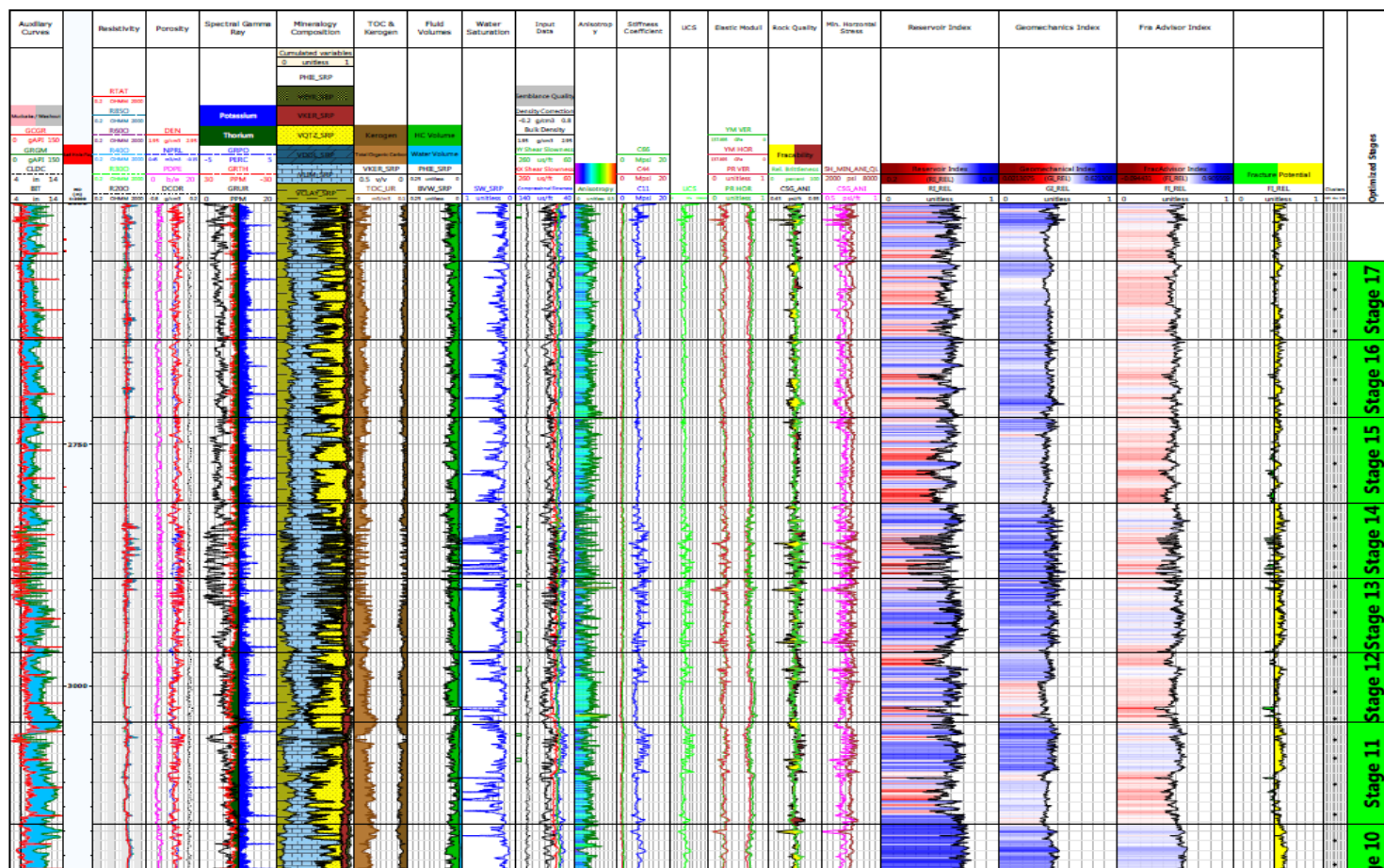


0%
NPT



100%
RESERVOIR
CONTACT

USA



\$1.3 MM COMPLETIONS COST

WIRELINE, PUMPING
SERVICES, PRODUCTION



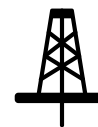
DELIVERED HIGH-QUALITY DATA IN 1 RUN



GULF OF MEXICO

LWD Services

Quality formation data helped to reach TD in HPHT deepwater well after four failures by competitors



DRILLED
31,330 FT
(9,549 M)



ENDURED
28,000 PSI
AND 290°F
(143°C)



CENTRALIZED SERVICES COLLECTED HIGH-QUALITY, REAL-TIME LOGS



BRAZIL

MWD, LWD, and SLS Solution

Compact footprint provided space for more services and increased interpretation efficiency

Reaction time improved for comprehensive interpretations



**1 UNIT
FOR
MULTIPLE
SERVICES**



**IMPROVED
REACTION
TIME**



LOGGING WHILE-DRILLING SERVICES

Delivering Wide-Spectrum Formation
Evaluation for any Drilling Environment





LOGGING WHILE-DRILLING SERVICES

WELL PLACEMENT

GuideWave™ Azimuthal Resistivity Tool

DRILLING DYNAMICS

Hostile-Environment Logging (HEL™)
Bore and Annular Pressure (BAP™)
True Vibration (TVM™)

PETROPHYSICS

Multi-Frequency Resistivity (MFR™)
Thermal Neutron Porosity (TNP™)
Azimuthal Density (AZD™)
SpectralWave™ Azimuthal Spectral Gamma Ray Tool

RESERVOIR ENGINEERING

PressureWave™ Tool

GEOLOGY

SineWave™ Microimager
UltraWave™ Acoustic Microimager

GEOMECHANICS

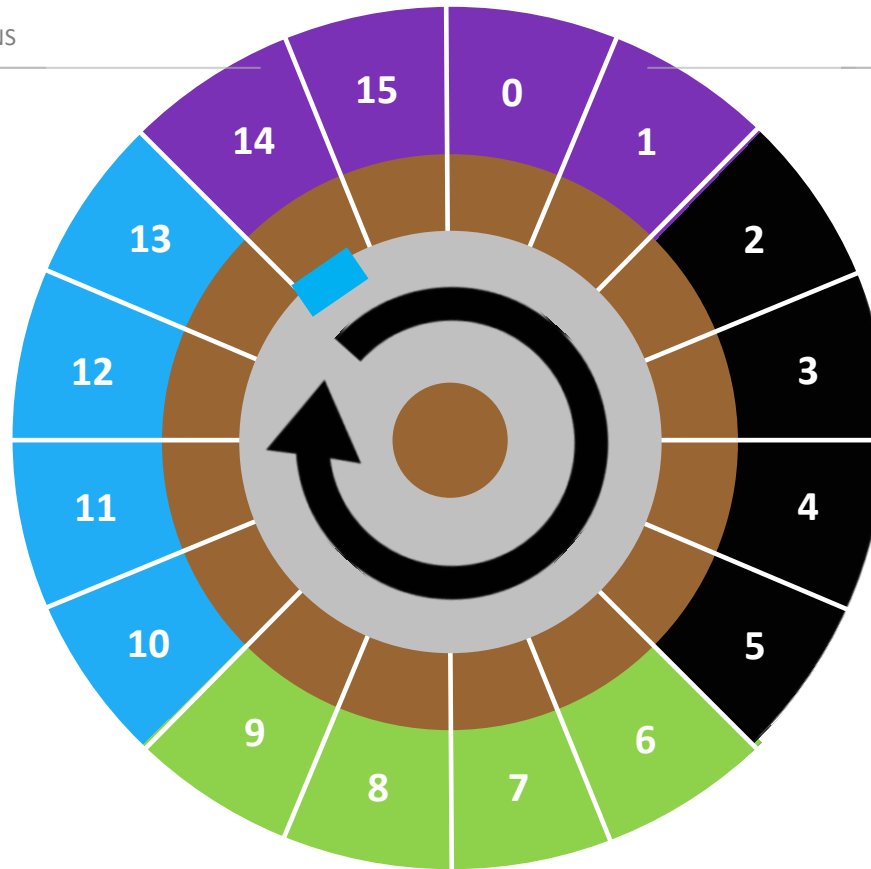
CrossWave™ Azimuthal Acoustic Tool
ShockWave™ Acoustic Tool



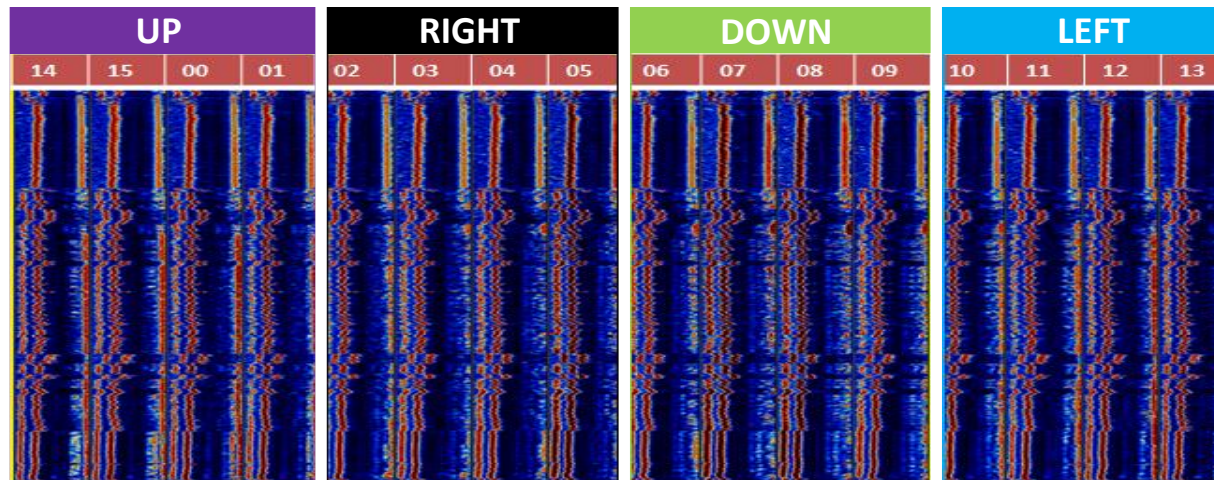


CROSSWAVE AZIMUTHAL ACOUSTICS

The first and best direct azimuthal measurement tool on the market



Azimuthally-oriented waveforms sets are acquired over 30 seconds and sorted into 16 azimuthal bins



Optimum stoneley arrivals can be isolated by bin and quadrant

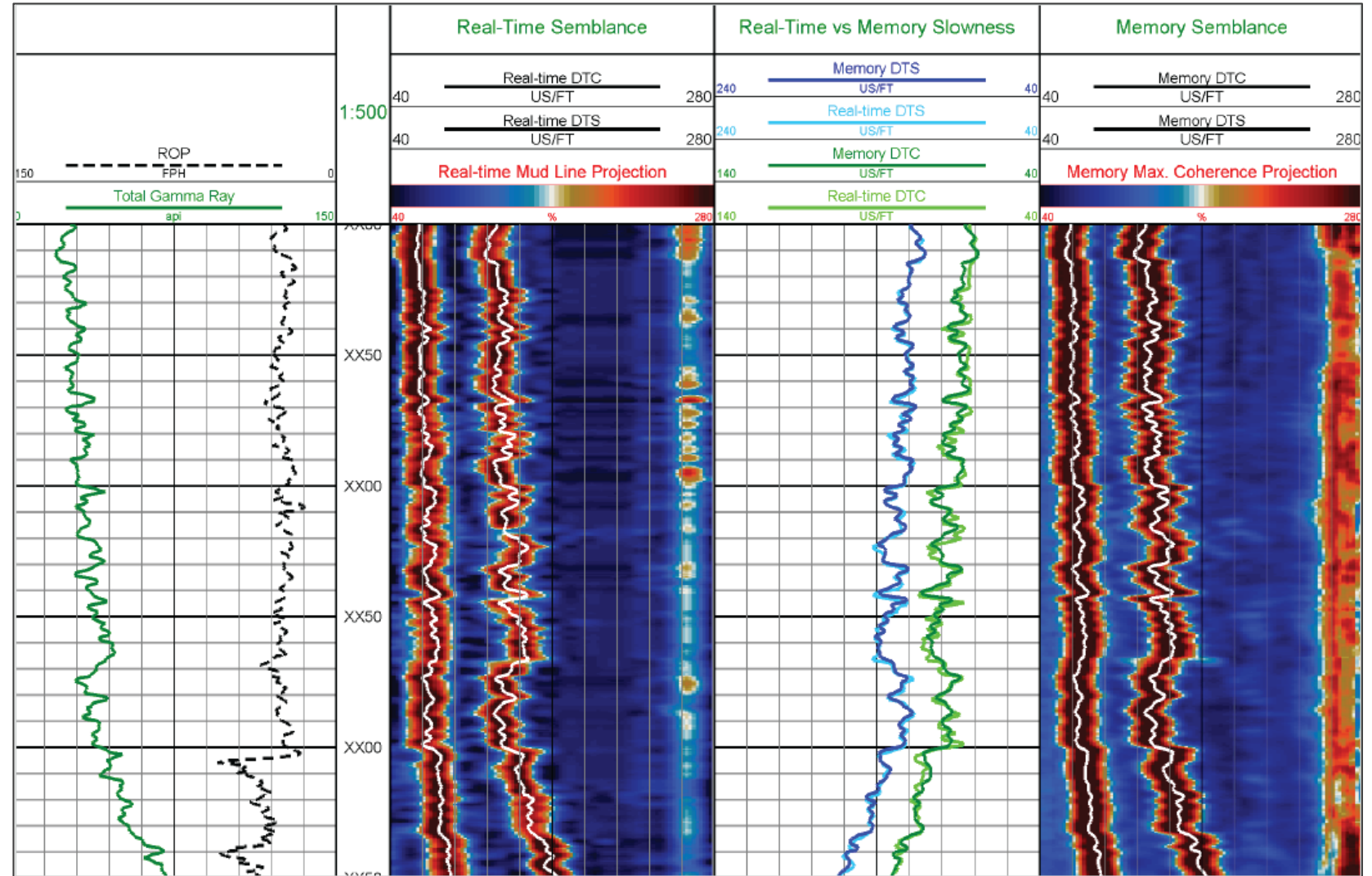


CROSSWAVE AZIMUTHAL ACOUSTICS

The first and best direct
azimuthal measurement
tool on the market

MOST PRECISE

DTC AND DTS
REAL-TIME
MEASUREMENT



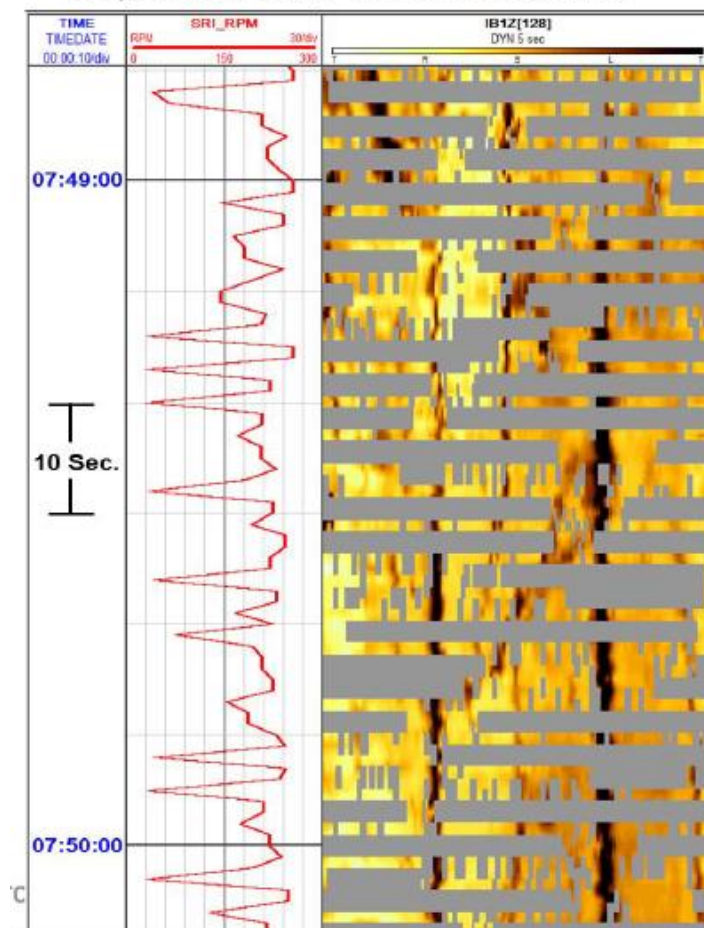
Real Time vs. Memory Log



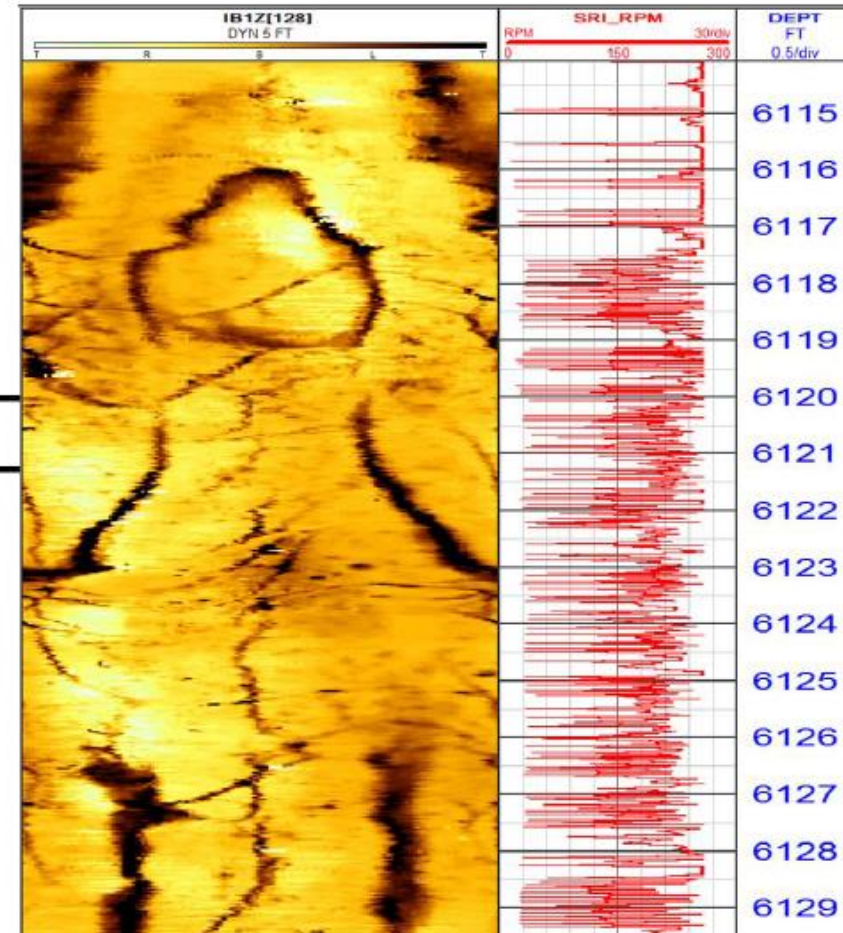
SINEWAVE ELECTRICAL IMAGER

Best high-resolution imaging tool in the market for high stick-slip environments

Expanded Raw Time-Based Plot



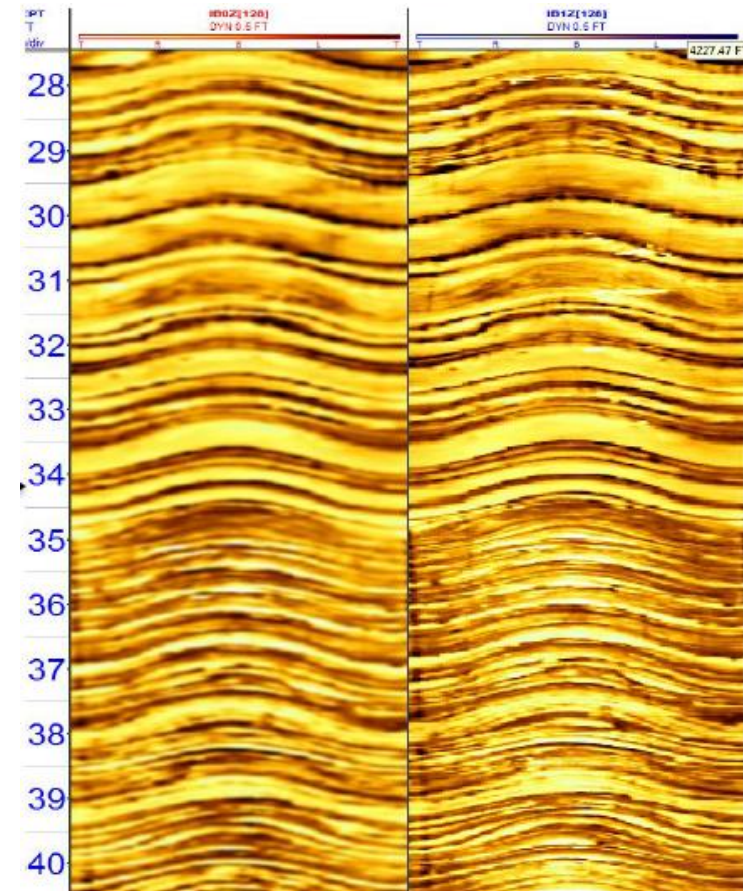
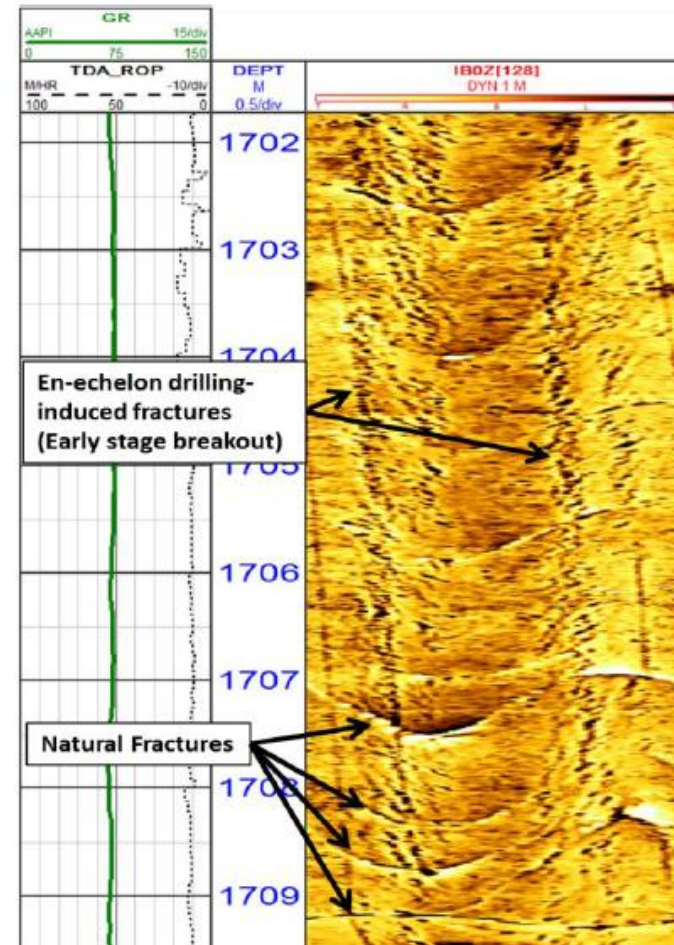
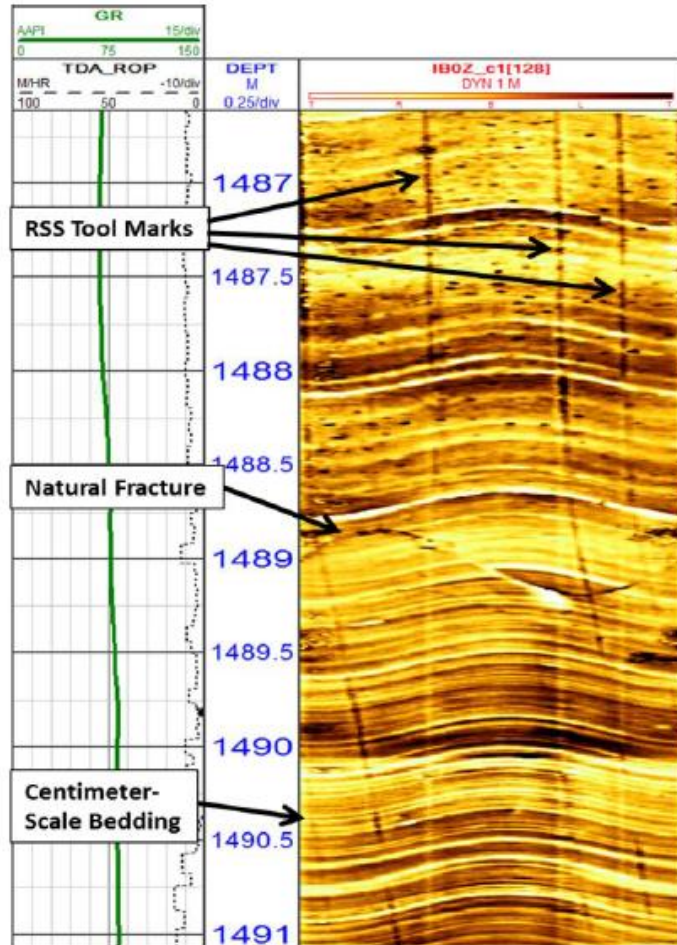
1:20 Scale Depth-Based Plot





SINEWAVE ELECTRICAL IMAGER

High-quality images for identifying formation features with precision



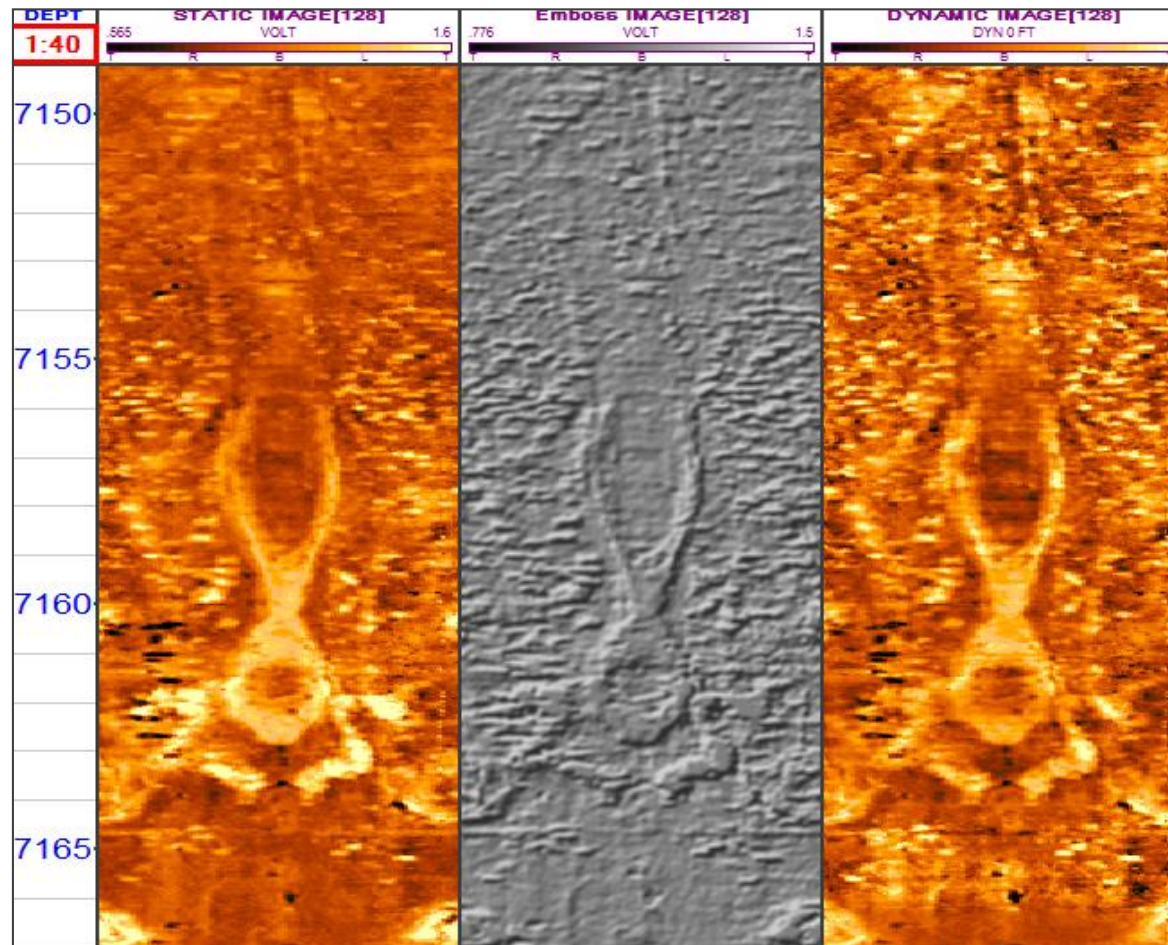


LWD ULTRASONIC HIGH RESOLUTION IMAGER

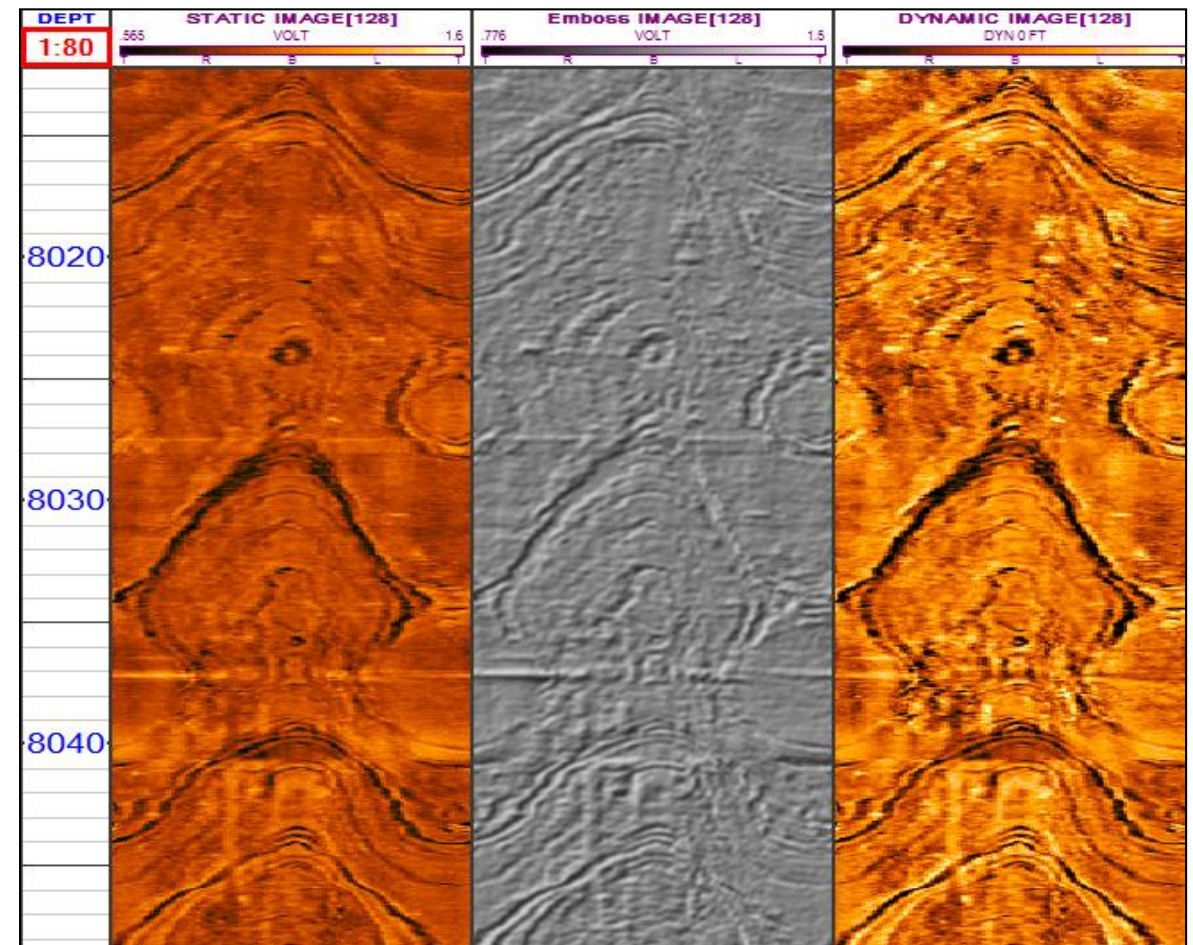
High resolution formation images in oil based mud environments

FIRST
IN THE
INDUSTRY

Possible Fossil



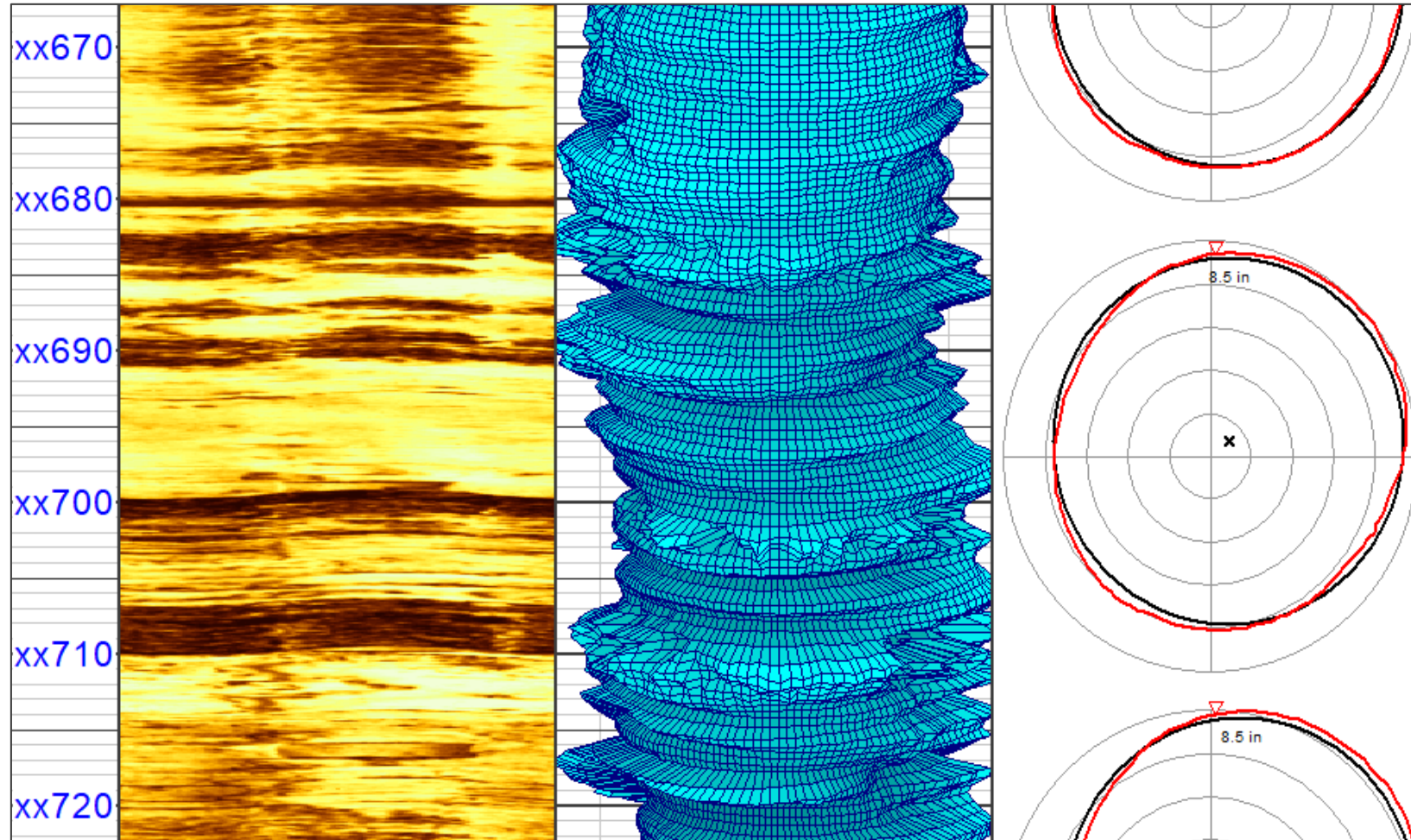
Irregular Bedding (Ball and Pillow Structure)





LWD ULTRASONIC HIGH RESOLUTION IMAGER

High resolution caliper image for assertive cementing and completion programs



128 SECTOR IMAGE

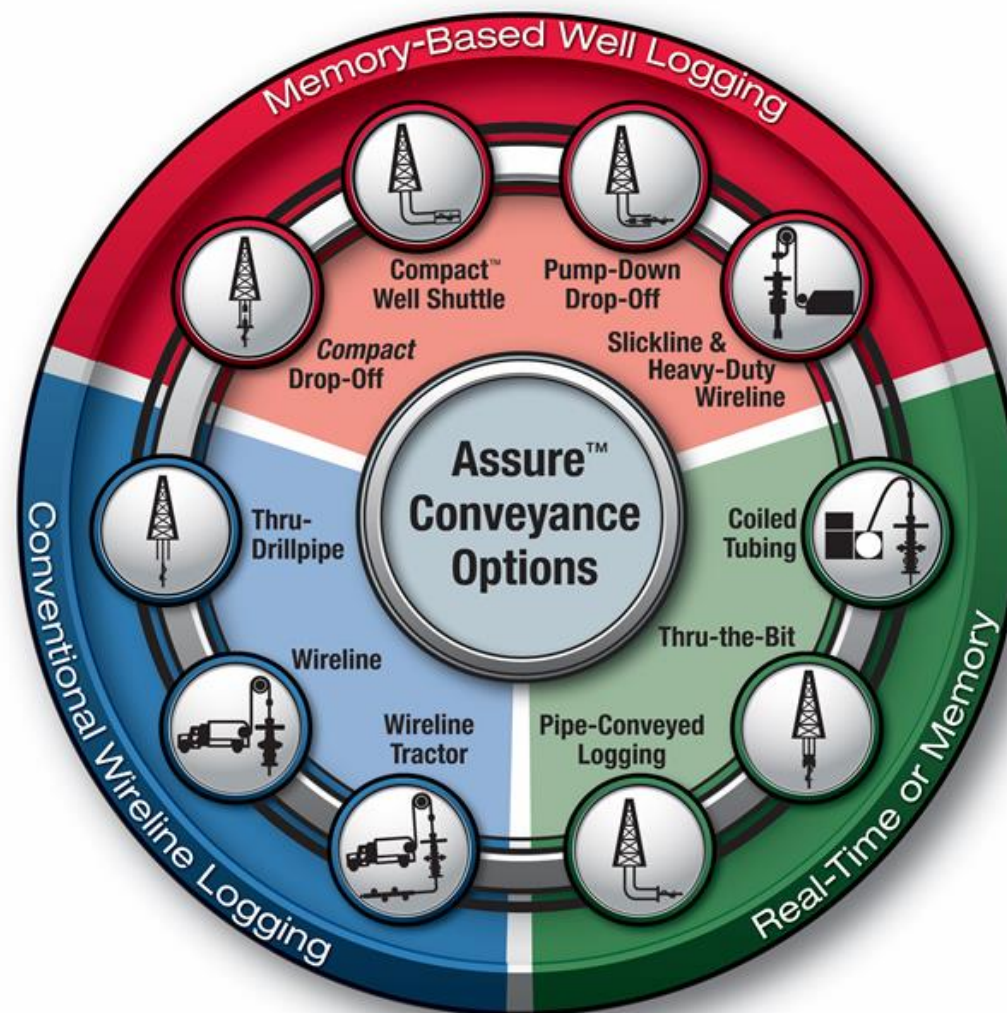
Reliable high resolution
wellbore evaluation
acquired while drilling



COMPACT & ASSURE

TECHNOLOGY OVERVIEW

- Designed to be slim and memory or real time capable
- Provide the safest, lowest risk and fastest method of acquiring open hole data
- Addresses typical challenges with open hole logging





COMPACT AND ASSURE

DELIVERING VALUE

- Operator made costly mistake
- Captured data in challenging deviated well
- Zero NPT
- Next logging job awarded

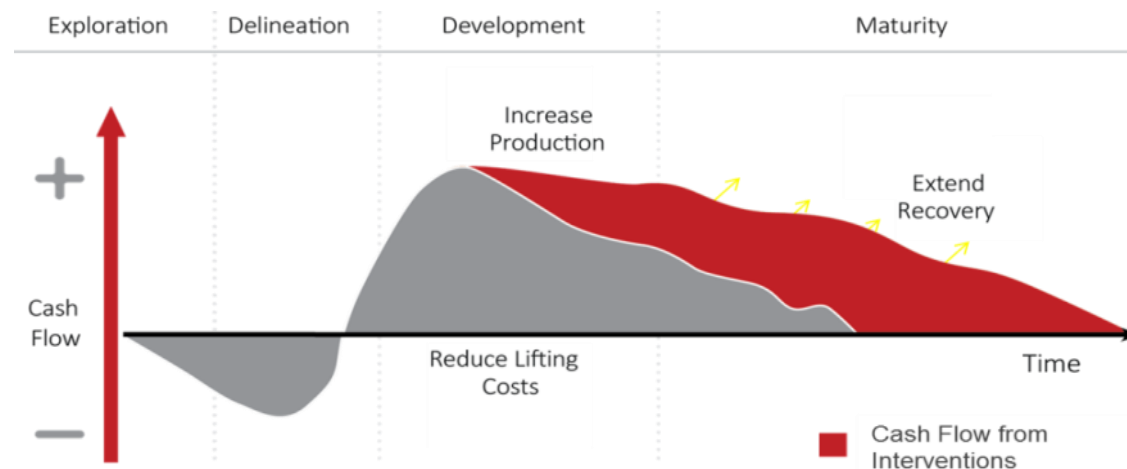
SAVED 4 DAYS OF RIG TIME



RAPTOR® CASED HOLE RESERVOIR EVALUATION

TECHNOLOGY OVERVIEW

- Allows monitoring of reservoir through cased wells to monitor changes
- **World's most advanced system** to provide unparalleled accuracy and sensitivity



PRIMARY APPLICATIONS FOR RAPTOR



RAPTOR® IDENTIFIES RECOMPLETION TARGET

DELIVERING VALUE

- Production improvement required
- Raptor team worked closely with the customer to develop solution
- Co-authored paper with operator to be presented at 2019 Offshore Mediterranean Conference

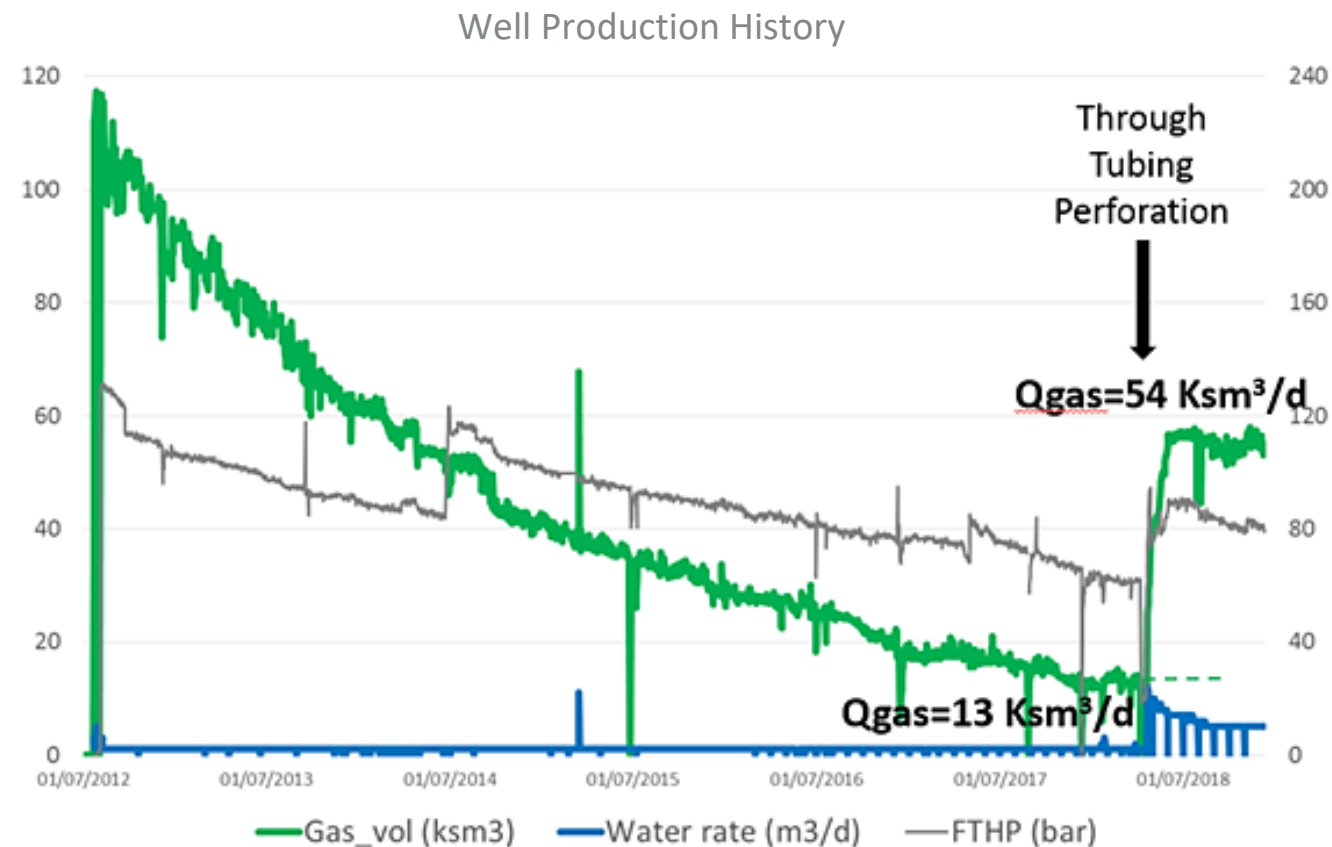
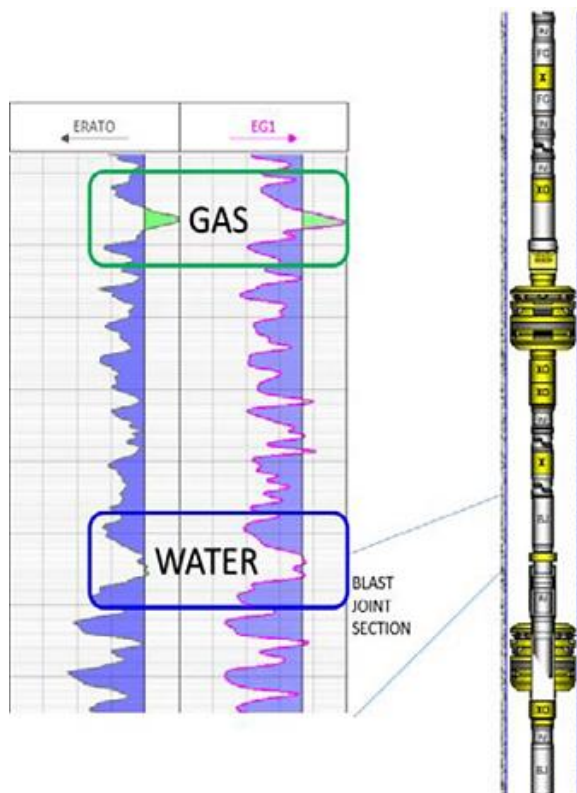
4X PRODUCTION INCREASE





RAPTOR[®] IDENTIFIES RECOMPLETION TARGET

4X PRODUCTION INCREASE





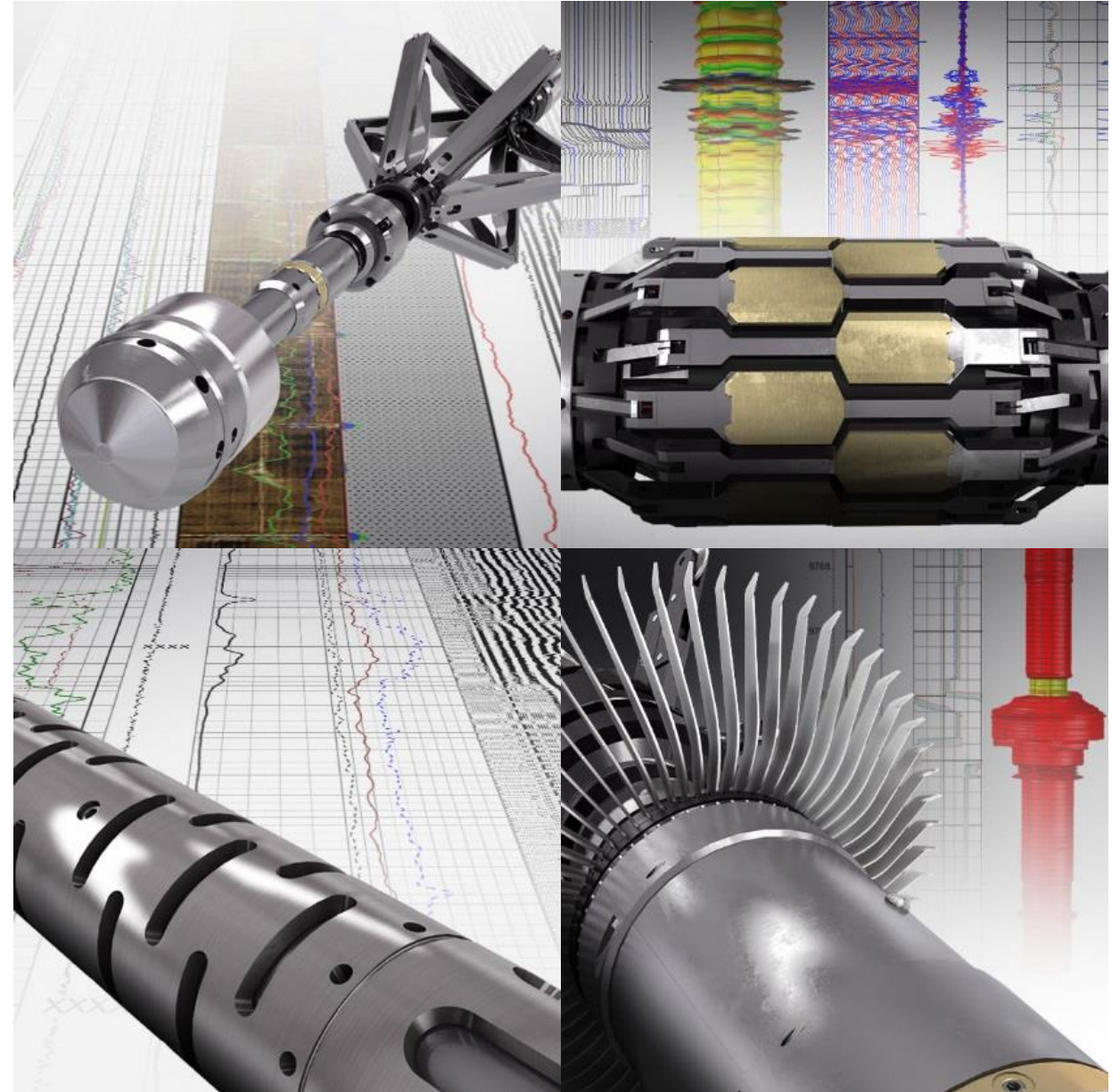
SECUREVIEW[®] CASING AND CEMENTATION

TECHNOLOGY OVERVIEW

Enables operators to determine well integrity with confidence

FAILURE CONSEQUENCES

- Hazards to HSE
- Compliance penalties
- Reduced asset performance





SECUREVIEW[®] AND METALSKIN[®] LINER

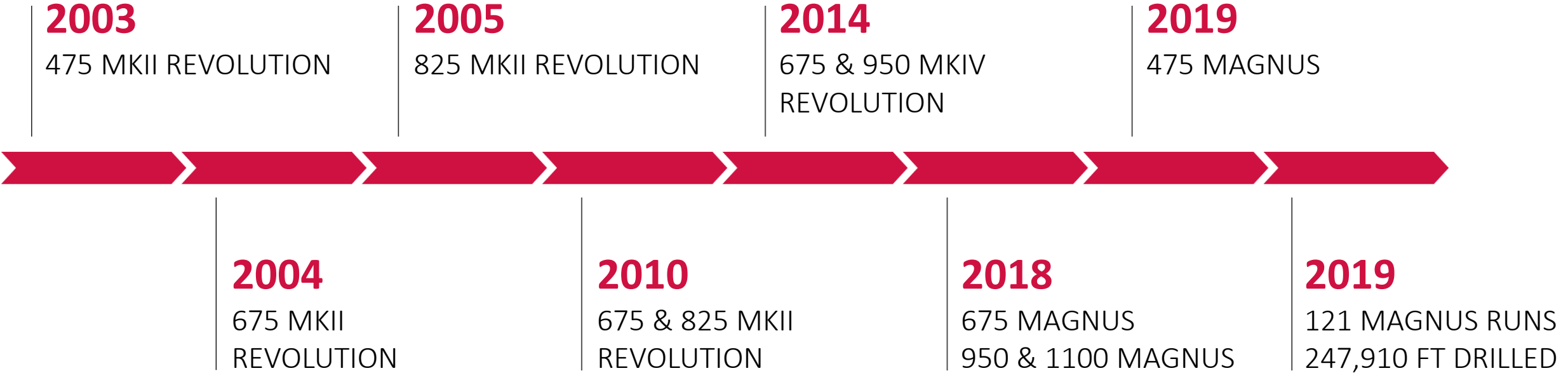
DELIVERING VALUE

- Ethylene storage well down
- Diagnose and restore casing integrity in an ethylene storage well
- Reduced out-of-service time from 33 weeks to just 8 weeks

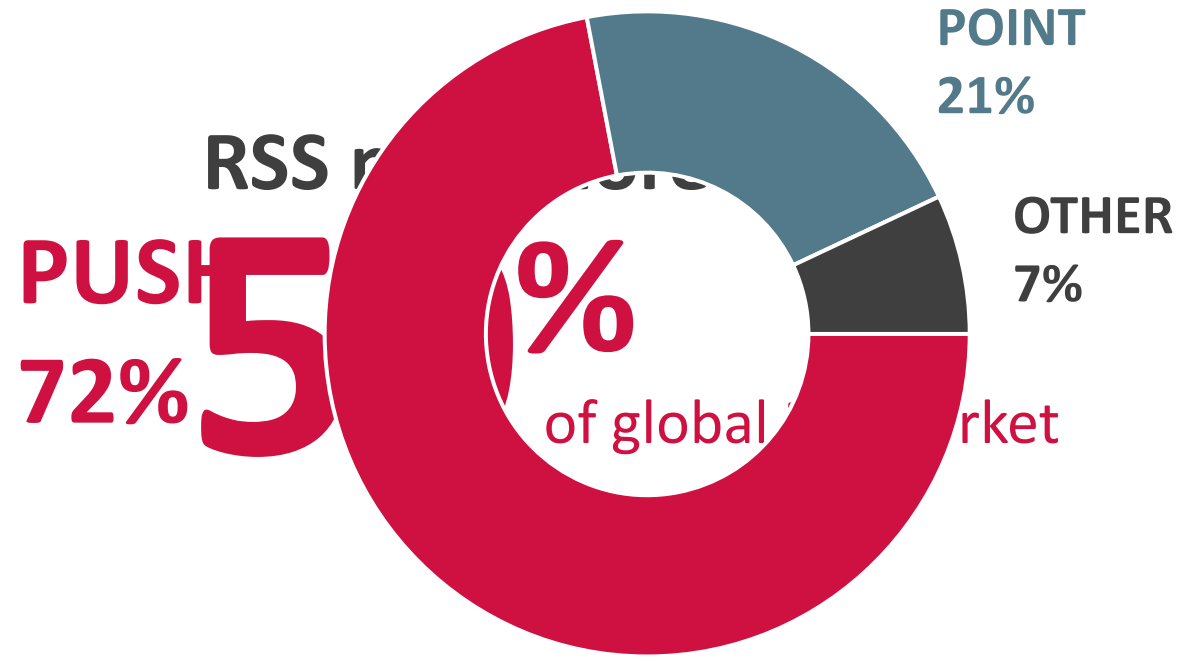
SAVED \$120M IN DOWNTIME



PUSHING FORWARD OUR RSS LEGACY



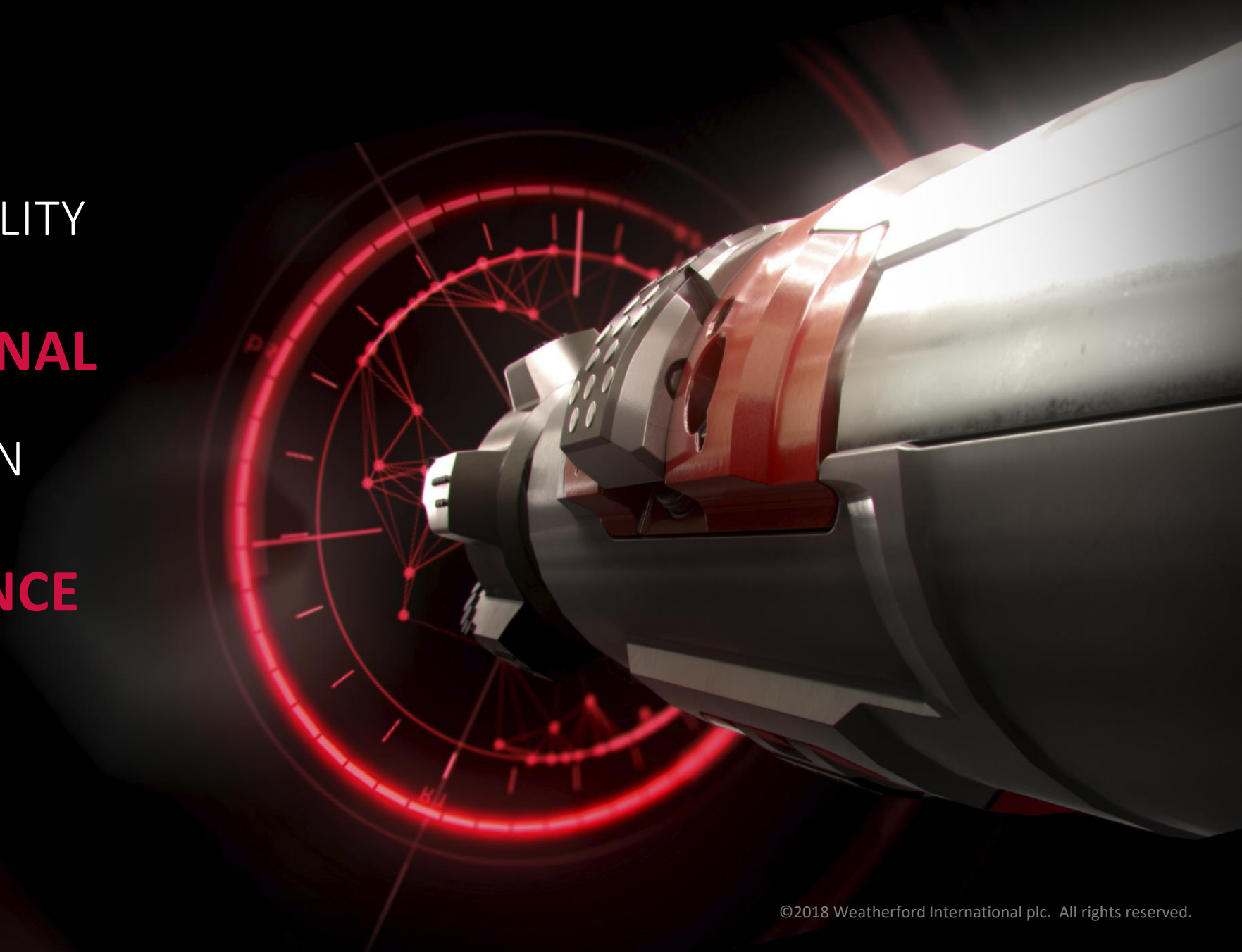
RSS NO LONGER NICHE, PUSH DOMINATES



RUGGED DESIGN
FOR LASTING RELIABILITY

**PRECISE DIRECTIONAL
STEERING**
FOR STAYING ON PLAN

**HIGH-PERFORMANCE
DRILLING**
FOR COST-EFFECTIVE
WELLBORES

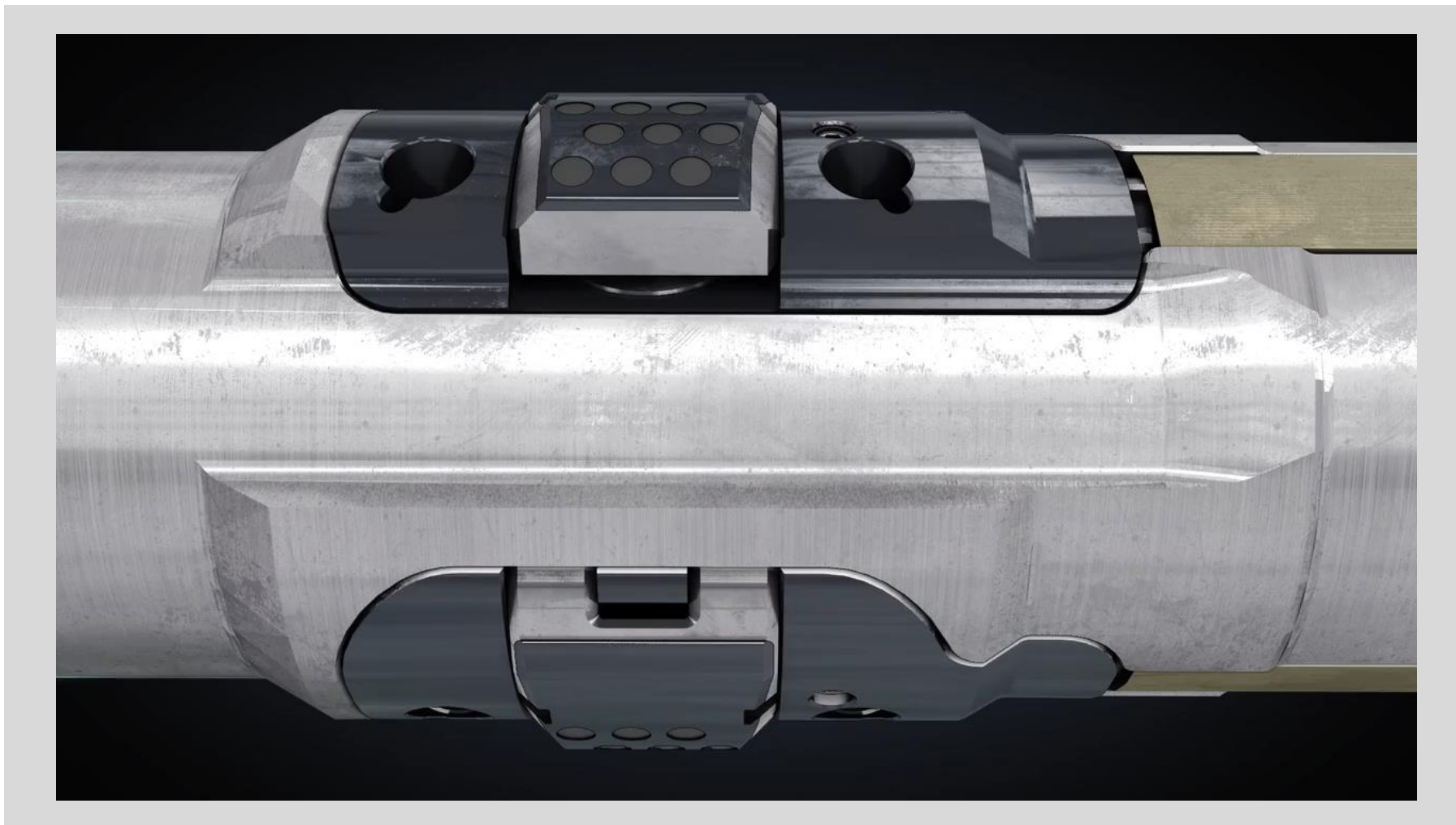




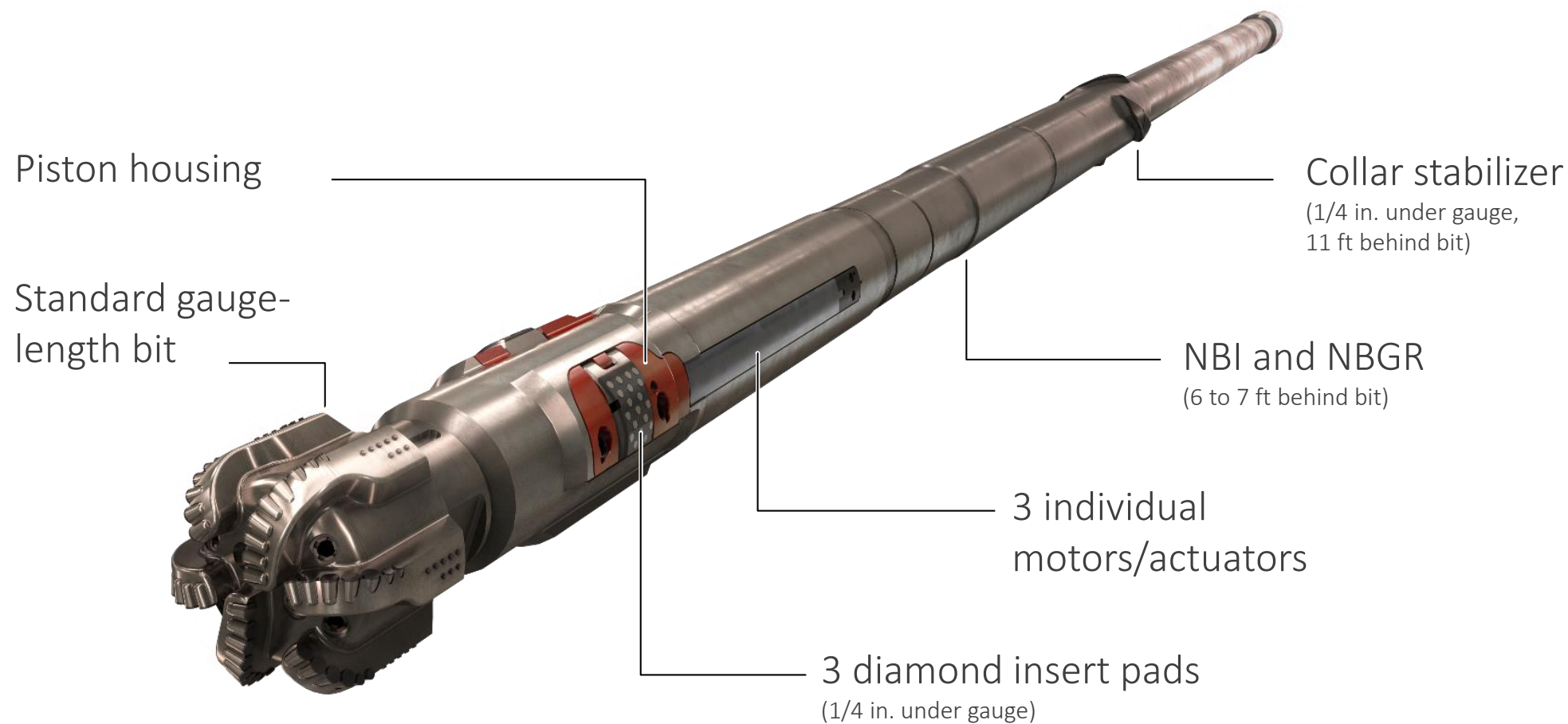
OVERVIEW



INTERNAL MUD FLOW PATH



RSS TOOL LAYOUT



PRIVATE FIELD TESTS

9 visits

22 runs

18,739 ft

198 drilling hours

12°/100 ft non-motorized

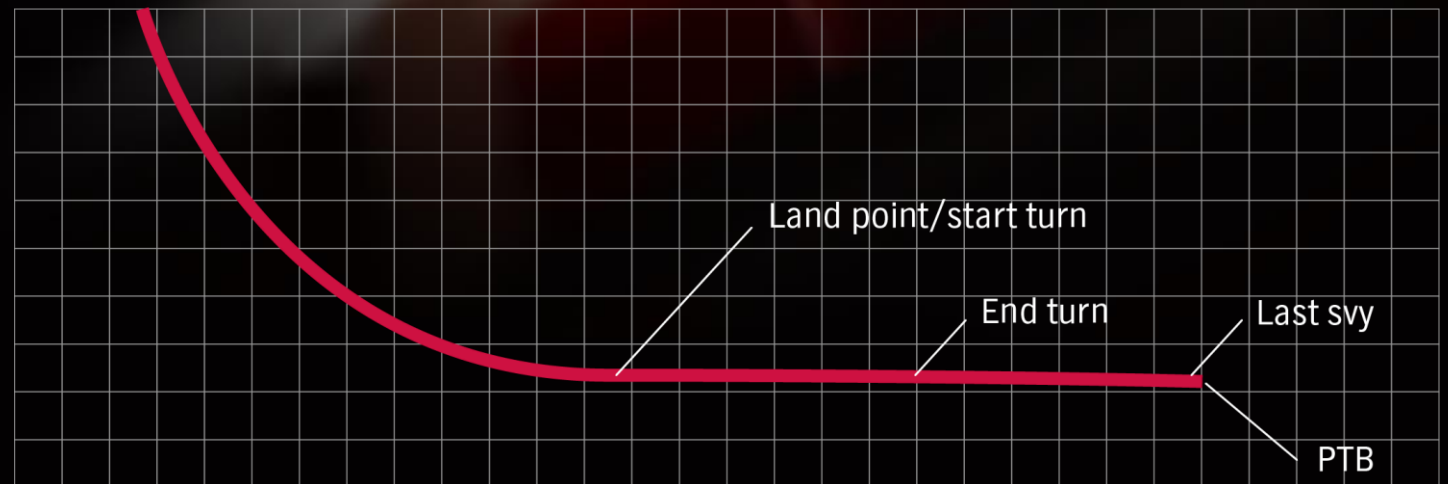
10°/100 ft, 240 rpm motorized

Successful autopilot functionality

Build, turn & lateral in single run



PRIVATE FIELD TESTS



FIRST OFFSHORE WELL IN MEXICO

All well objectives achieved:

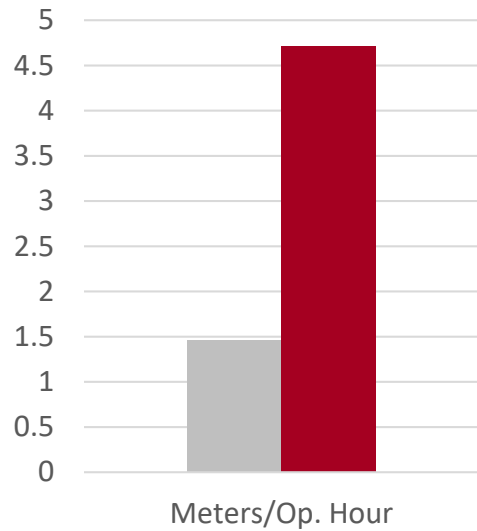
- Drill well 8.5-in. hole section **in a single run**
- Maintain well trajectory keeping **DLS < 3.75°/30 m** to maintain good hole quality
- No more than **5-m distance** to plan at TD



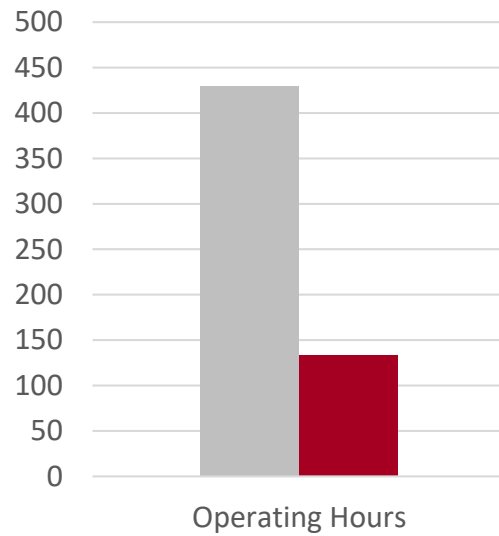


FIRST OFFSHORE WELL IN MEXICO

PERFORMANCE KPIs (PROG VS ACTUAL)



■ PROG ■ ACTUAL



■ PROG ■ ACTUAL



FIRST OFFSHORE WELL IN MEXICO

RIG TIME SAVED:
12.4 DAYS

VALUE TO CLIENT:
\$1.6 M

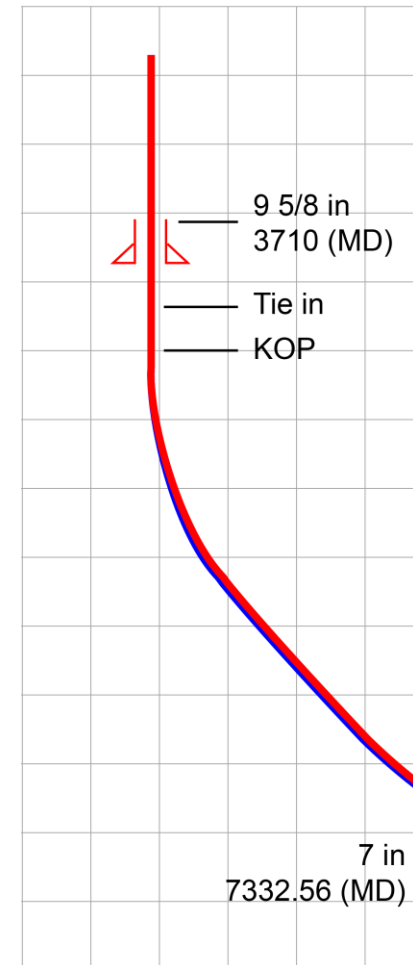


FIRST WELL DRILLED IN MIDDLE EAST

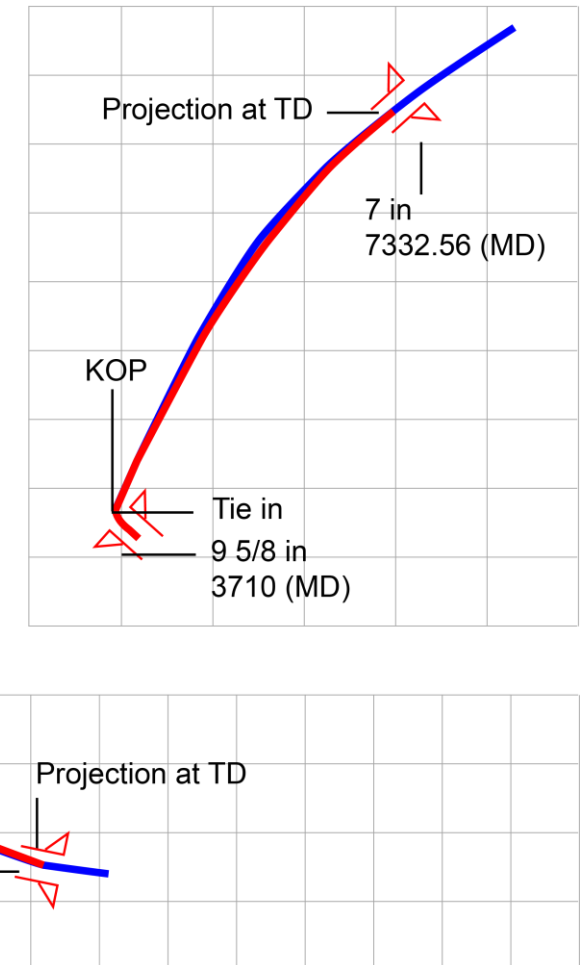
All well objectives achieved:

- Kicked off from **vertical**
- Landed the curve section successfully in a **single run**
- Excellent hole conditions **eliminated risk of stuck pipe**
- **7-in. liner** run to bottom successfully

SIDE VIEW



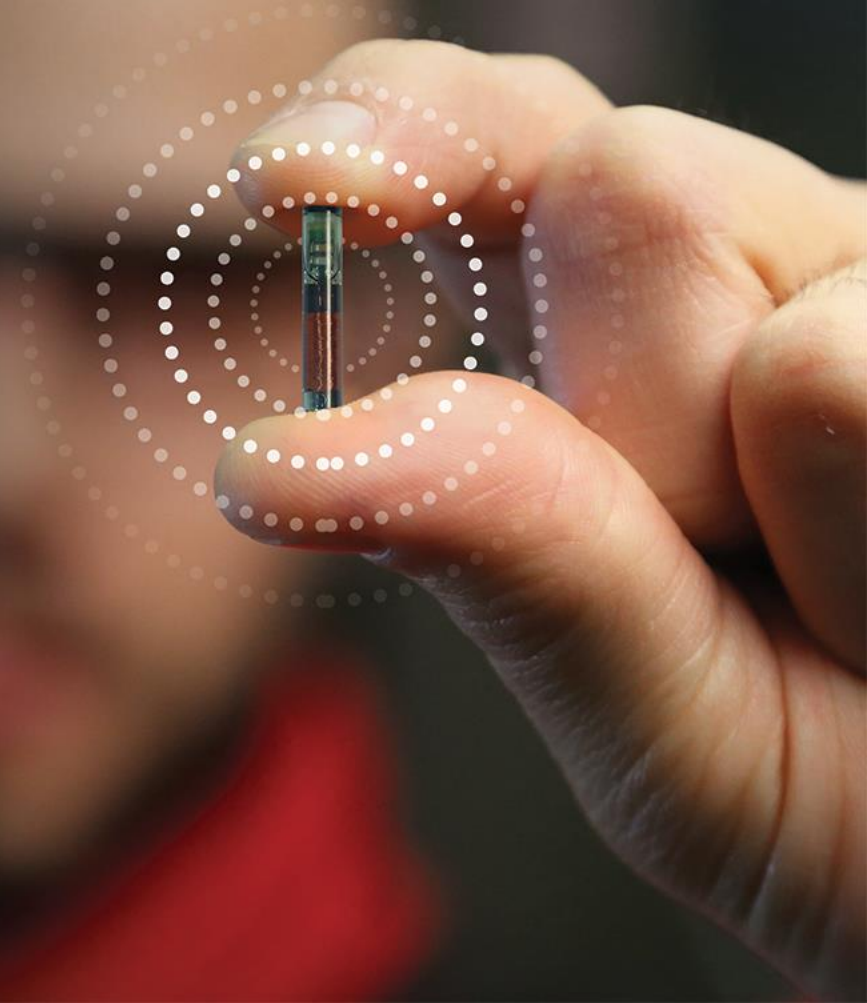
TOP VIEW



RipTide® DRILLING REAMER

Maximizing hole-enlargement-while-drilling speed and reliability

- Unlimited multiple on-demand activations
- Activation and deactivation via RFID Tags
- Activation and deactivation via pressure commands
- Tandem tools can be run in the same BHA to improve efficiency
- Recorded downhole memory
- Full-bore ID





RipTide® CUTTING DESIGN

- Unique pattern for each block size maximizes drilling performance
- Fixed block size eliminates risk of incorrect hole opening and operates at full actuation
- Not dependent on flow rates to protect sensitive formations
- Latest PDC cutter maximizes durability and ROP
- Compatible modeling software helps optimize the PDC cutter layout



JetStream® RFID CIRCULATION SUB

Maximizing the efficiency of challenging offshore drilling operations

- Provides full through-bore flow
- Unlimited cycles, no balls

**1.5 DAYS AND
\$350,000 SAVED**
IN THE CASPIAN SEA

**TOTAL DEPTH
ACHIEVED**
IN A CHALLENGING
NORTH SEA WELL



REAL RESULT

USA, PERMIAN

Motorized Magnus[®] RSS

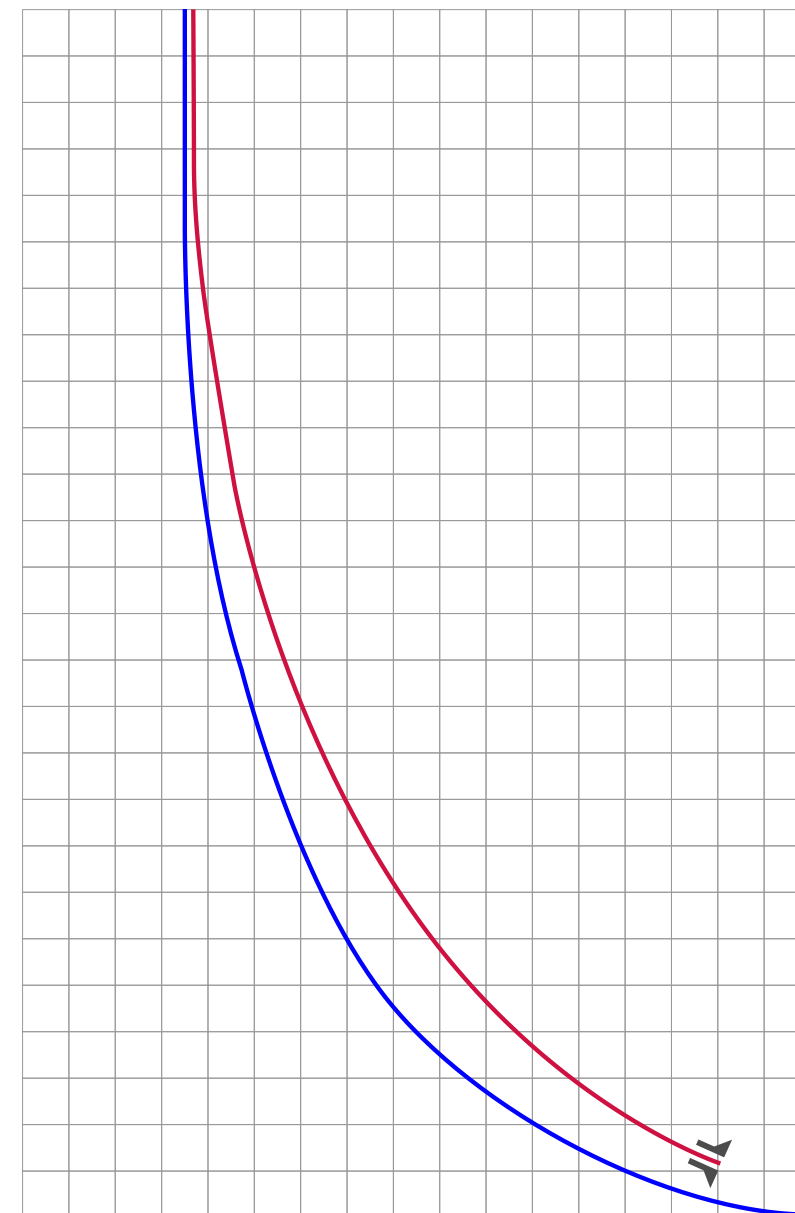
DRILLED 3376 FT
IN 46 HOURS

SUCCESSFULLY LANDED
CURVE SECTION AT
70 DEGREES INCLINATION

MAXIMUM DL ACHIEVED
9.9 DEG/100FT AT THE
BOTTOM END OF THE CURVE

CURVE SUCCESSFULLY
CONTROLLED
TO 6 DEG/100FT

USED A 675-7857
HYPERLINE MOTOR



REAL RESULT

ONSHORE MEXICO

Magnus[®] RSS, RipTide[®] Reamer & LWD

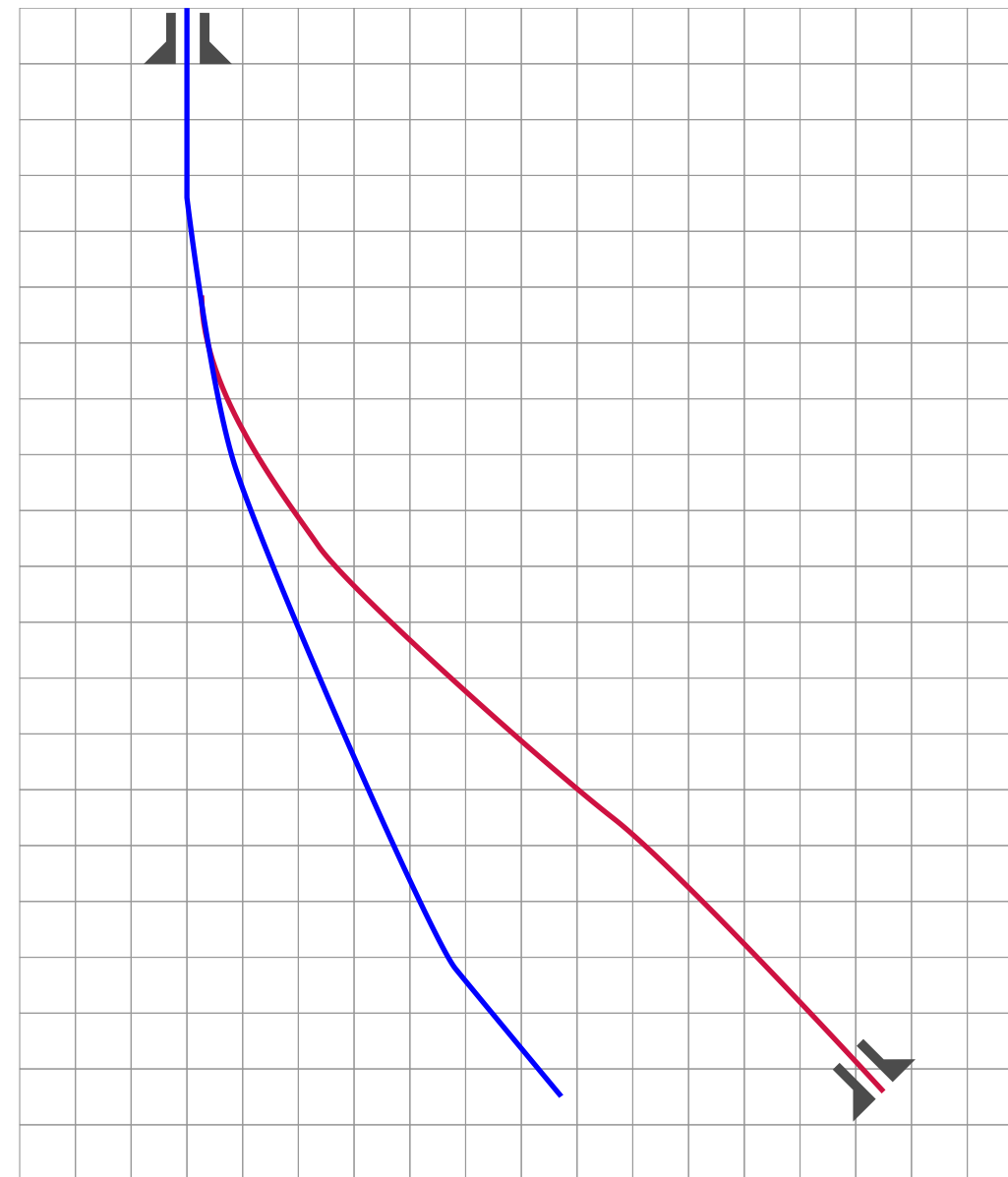
SUCCESSFULLY OPENED FROM 8 ½" TO 9 7/8"

WHILE LANDING A DIRECTIONAL WELL

DRILLED 2840 ft. TO TD

ACHIEVED 2.5°/30 M DOGLEG

AS PER WELL PLAN



**GRACIAS
THANK YOU**

