Baker Hughes

Overall Presentation

Cesar Pulido

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HSE moment—5 fundamentals applied to driving

For any journey we must always determine if it is necessary or if there is another way. Use Road Journey Management Planning Risk Assessment to identify the risks and score the risk ranking.

If the Risk Assessment determines that a JMP is required, identify the controls that will mitigate the risks. Such as, if trip will require several hours driving time, scheduled breaks must be planned.

If things change during the journey, i.e. planned route is expectantly closed causing a detour, or the weather unexpectedly changed to heavy rain, the journey should be suspended and risks re-evaluated to identify new mitigation controls.

Any lessons learned, things that went well or not so well, should be captured and used to improve the process.



Identify hazards

Is the trip necessary? Apply RJMP Risk Assessment



Control hazards & verify barriers

Develop Road Journey Management Plan as required by RA



Follow processes & procedures

Follow RJMP as outlined



Manage change

If conditions change mid-journey, re-evaluate risk and update RJMP



Learn & improve

Document lessons learned and incorporate to improve process

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Digital pilots—current testing across Baker Hughes

Electrical safety



High-voltage voltage sensing wearable



High/medium voltage sensing band



Low/med voltage sensing band

Lone worker



Biometric sensors



Location monitoring wearables



Workforce management

Material handling



Ergo sensor platform



Powered gloves



Exoskeletons

At heights/confined spaces



Sarcos robot



Gas monitoring wearables



Smart hard hats

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Baker Hughes

Digital tools—increasing safety & productivity

Telepresence



Ergonomic sensors and exoskeletons



Virtual assistant



Electric current sensing



Heat sensing



Drones



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Smart helmet

Smart Helmets are safety hardhats that virtually connect engineers in the field directly to headquarters support staff, who can provide immediate troubleshooting and guidance through complex tasks via audio and video.

Smart Helmets have the ability to relay real-time data, technical drawings and procedures into the helmet's visor and receive expert feedback—meaning missions that required several trips can be completed in just one outing. If widely adopted, this technological advancement has the potential to save oil and gas operators millions of dollars.

Click here to see how Baker Hughes' smart helmets point to the future in oil and gas.



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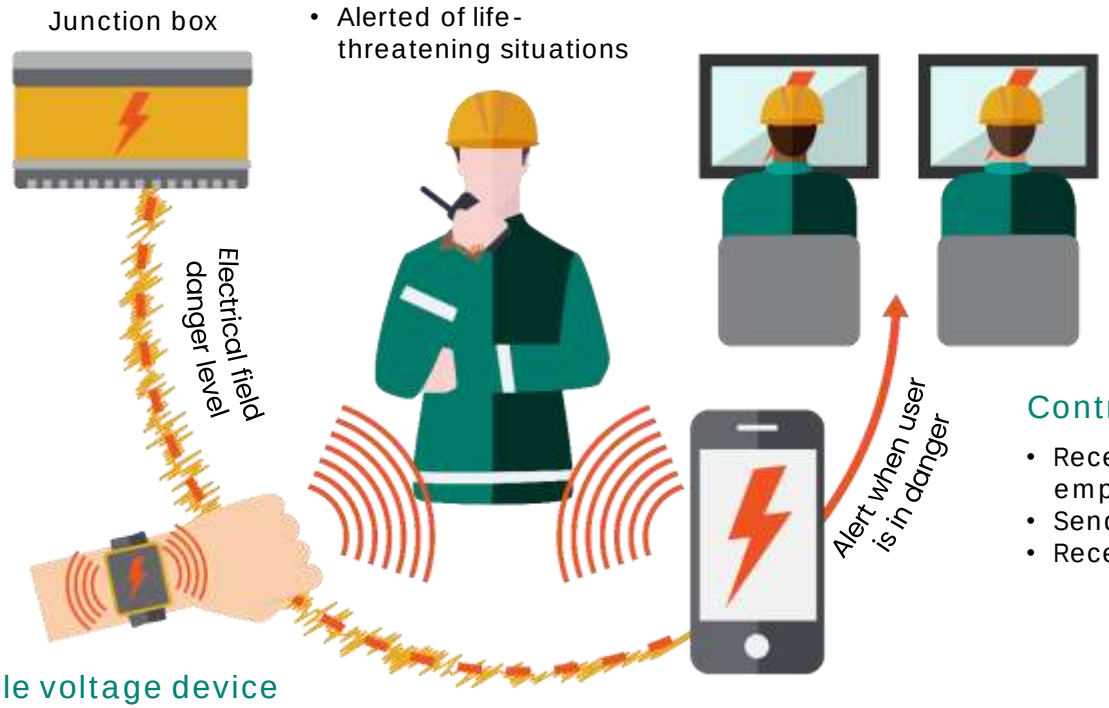
Wearable voltage sensing devices

Voltage sensing devices are wearable devices that detect energized assets and alert the wearer when in close proximity, preventing contact with known and unknown energized assets.

The devices are engineered for the field technician who is not focused on a specific trade, but during normal day-to-day operations, interact with electrical and maintenance procedures across various assets and equipment.

GE businesses have been piloting a variety of commercially available devices as no one device covers both AC and DC energy and the wide range of voltages present in many work locations.

These devices do not replace direct measurement tools, but they do provide an additional/secondary layer of protection for the field technician in avoiding electrical shock.



User

- Alerted of life-threatening situations

Control center

- Receives alert if employee is in danger
- Sends check-in request
- Receives user check-in

Wearable voltage device

- Detects electric fields
- Alerts user of danger
- Gives vibration feedback
- Interacts with app

Voltage device app

- Alerts user of danger
- Checks in with control center

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Predictive analytics

What are predictive analytics?

… use of injury/incident data to develop predictive models for identifying priority risk areas

How are the results used?

… to optimize resources and support to eliminate or mitigate risk in those focus areas

What is the process?

Data collection/ profiling → Data cleanup/ learning → Initial model creation

1. Validate model outcome
2. Capture improvements
3. Improve data quality
4. Improve data science model

Model automation/Predix → Embed in process/robotics

HiPo pilot

What is HiPo?

… an HSE incident or near miss where the most probable outcome is (i.e., had a high potential [HiPo] for) a serious adverse effect - catastrophic injury, significant property or environmental damage, or fatality. Also called a Potentially Severe Event (PSE).

Why focus on HiPo?

Injury/illness reduction minimal to flat
… exponential reduction projections not enough

Customer expectations … "rigorous process to identify potential high risk hazards, assess and manage"

What do model results look like?

Analysis

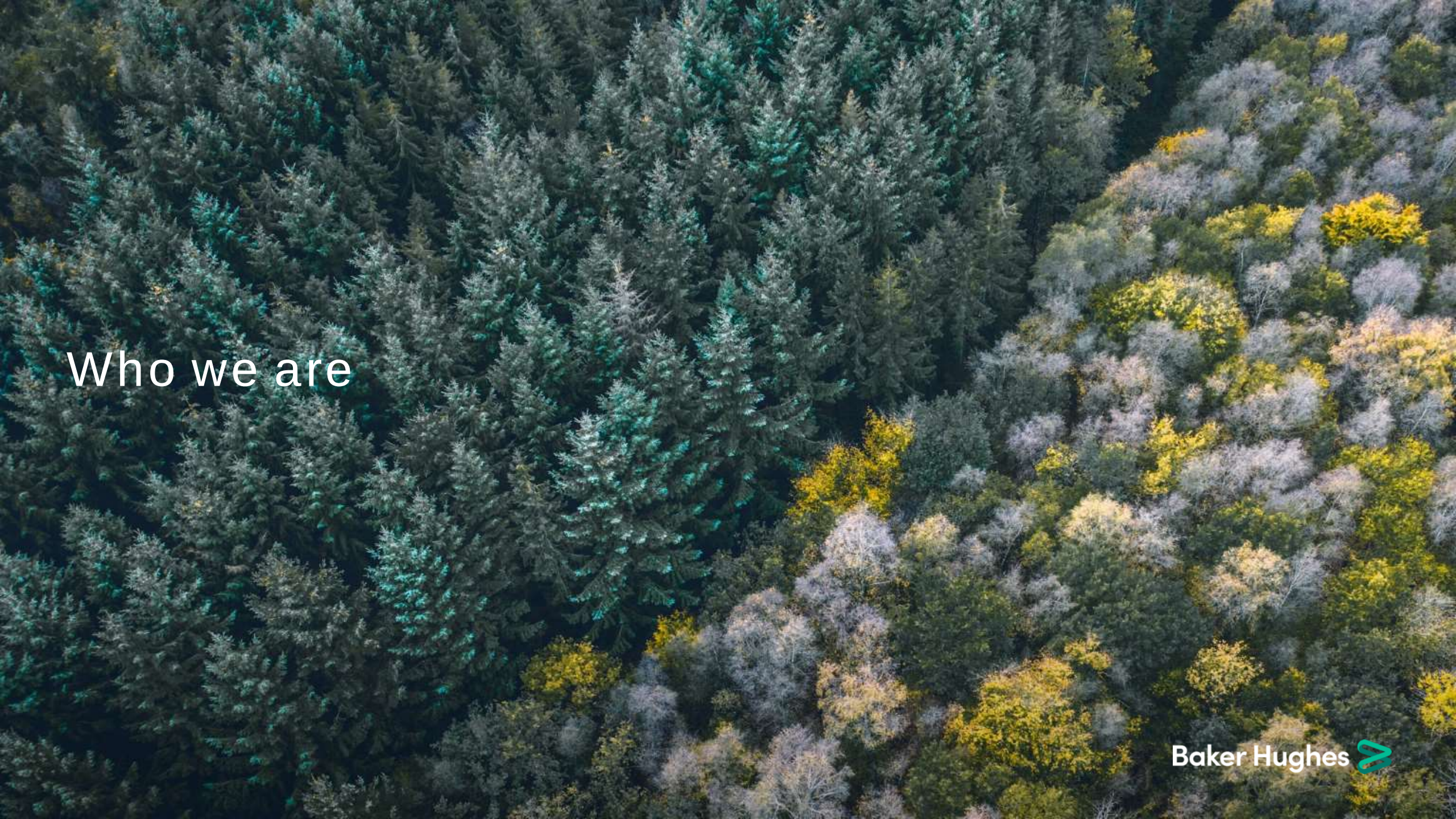


Defense recommendations



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Who we are
Baker Hughes

Leading the energy transition

We have committed to achieve net-zero carbon eq. emissions by 2050, and invest in new technologies to help customers reduce their emissions.

Low carbon energy solutions

Reduce flaring, venting, and fugitive emissions



Efficient power generation



Efficient oilfield



Renewables and alternative energy



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How we innovate

Industrial innovation | Digital innovation | New technology and ventures

- 9,000+ engineers and scientists
- ~$700M in research investment
- 17 global innovation centers
- 8 additive manufacturing centers
- ~2,700 patents issued in 2018
- >100 new product launches in 2018
- >10,000 additive parts since 2017





Our values

Grow

See challenge as opportunity, and learn every day.

Collaborate

Inspire, be inclusive, and bring out the best in each other.

Lead

Make, invent, and perform with impact.

Care

Do the right thing, always, for our customers, our people, and the environment.

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Our strategy

Leading product companies

- Innovative products & services
- Integrated solutions



Lead with technology

- Advanced manufacturing
- Digital transformation



Lead the energy transition

- Gas value chain
- Low carbon energy solutions



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Baker Hughes

Executive leadership team



Lorenzo Simonelli
Chairman & Chief Executive Officer



Uwem Ukpong
Chief Global Operations Officer



Maria Claudia Borras
President & CEO, Oilfield Services



Neil Saunders
President & CEO, Oilfield Equipment



Rod Christie
President & CEO, Turbomachinery & Process Solutions



Derek Mathieson
Chief Marketing and Technology Officer
Acting BHGE Digital CEO



Rami Qasem
President & CEO Measurement & Controls



Brian Worrell
Chief Financial Officer



Jody Markopoulos
Chief Transition Officer



Jennifer Hartsock
Chief Information Officer



Will Marsh
Chief Legal Officer



Harry Elsinga
Chief Human Resources Officer



Kevin Wetherington
Chief HSE, Security & Quality officer

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Our Product Companies

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Our product companies



Oilfield Services

Lower cost per barrel over the life of field



Measurement & Controls

Peace of mind for the world's infrastructure



Oilfield Equipment

Ultra-reliable technologies for the harshest environments



Turbomachinery & Process Solutions

Industry-leading availability and reliability

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Baker Hughes portfolio

Oilfield Services

• Coring Services • Logging-while-drilling Services • Surface Logging Services • Wireline Cased-hole Logging • Wireline Openhole Logging • Wireline Perforating & Drill Stem Testing Services
• Wireline Well Integrity Evaluation • Geoscience & Petroleum Engineering • Gaffney, Cline & Associates • Reservoir Modelling • Drill Bits • Measurement-while-drilling Services
• Drilling Fluids & Cementing • Drilling Optimization Services • Coiled Tubing Drilling Services • Integrated Coiled Tubing Drilling • Casing & Liner Drilling Services • Drilling Tools & Equipment
• Integrated Well Construction • Liner Hanger Systems • Multilateral Systems • Packers • Gas Lift Systems • Subsurface Flow Control • Subsurface Safety Systems • Multistage Completions
• Stimulation and Fracturing • Sand Control • Isolation Valves • Completion Fluids • Perforating • Intelligent Completions • Well Monitoring and Analytics • Artificial Lift • Flow Assurance
• Production Optimization • Asset Integrity • Fishing Services • Workover Systems • Smart Services • Plug & Abandonment Services • Integrated Plug & Abandonment Services

Oilfield Equipment

Subsea • Subsea Connect / quickConnect Subsea Tieback Solution / Integrated Production Enhancement / AptaraTM TOTEX-lite Subsea System / Early Engagement & Engineering / Field Development Planning Integrated SPS+SURF projects / engageSubsea • Subsea Production Systems (trees, controls, manifolds, electric systems, well access systems e.g., CWOR, IWOCS, power & processing)
• Subsea Wellheads (MS-700, MS-800, SFX) • Flexible Pipe Systems (conventional & composite flexible pipes, static & dynamic pipes, integrity management solutions, installation & commissioning)
• Subsea Asset Integrity Management Solutions • Subsea Well Intervention Services (LWI, RLWI), Fluid stimulation • Decommissioning Solutions (Subsea turnkey P&A, subsea well access equipment rental)
• Floating Production Systems (Risers & tensioner systems, tieback connectors, tendon connectors)
Surface • Surface Wellheads (Conventional, Multi-bowl, RSH – Riser Speedhead) & Aftermarket Services • Surface Pressure Control / Flow Control Valves & Actuators / Frac Rental Services
• Reinforced Thermoplastic Pipes (RTP)
Drilling Rig Equipment & Services • BOP systems, ram & annular BOPs, BOP control systems, monitoring & analytics, wellhead connectors, diverters, pulsation dampeners, marine riser systems, chokes & valves / Offshore Drilling Systems –Subsea (Drill ships & Semi-subs) / Offshore Drilling Systems – Surface (Jack-ups) / Onshore Drilling Systems • Rig Drilling Services
(After market services incl. recertifications, inspections, CSAs, engageDrilling)
Drilling tubulars • Speciality Connectors & Pipes

Turbomachinery & Processing

• Aeroderivative Technology • Heavy Duty Technology • NovaLT Technology • Impulse Technology • Reaction Technology • BCL • PCL • MCL • SRL • Blue-C • Axial • ICL - integrated compressor line
• Electrification • Advanced technologies • API 618 process compressor • PK – LDPE compressor • Turboexpander generator • Turboexpander compressor • Hot gas expander • Genuine spare parts
• Repairs • Field activities • Conversions, modifications and upgrades • Used serviceable materials • Long term service agreements • Advisory services • Digital services • Customer Training
• LNG main refrigerant compression • LNG power generation • Onshore compression • Onshore power generation • Offshore compression • Offshore power generation • Small Scale LNG
• Pre-assembled units • ORegen – Waste Heat Recovery ORC system for Power Gen • Waste Heat Recovery ORC System for Compression Services • ORChiller - Waste Heat Recovery for Cold Duty Generation • HIPER - Waste Pressure Recovery & CO2 abatement • Liquid Air Energy Storage • Adiabatic Compressed Air Energy Storage • Hydrogen turbines • BB1 DVS DVE BF pipeline pump
• BB2 DVSHF/THF pump • BB3 MSN centrifugal pump • BB4 DDHFR ring section diffuser pump • BB5 DDHF multi-stage centrifugal pump • BB5 DDHM high-pressure diffuser barrel multi-stage pump
• OH process pump • Vertical pumps • Pumps services • Fuel gas system • Hydraulic power recovery turbine • Anti-surge valve • Safety and Control Valves

Digital Solutions

• Advanced inspection Services • Condition Monitoring • Control Systems and Migrations • Emissions Measurement and Reduction • Flame Sensors • Flare Management • Flowmeters
• In-Line Inspections • Moisture Analysis • MWD and LWD Sensors • Non-destructive testing • Nuclear Instrumentation • Pipeline inline inspection • Pipeline pre-commissioning and maintenance
• Pressure Measurement • Process pre-commissioning and maintenance • Radiation Measurement • Visual Inspection

Software & Analytics

• BakerHughesC3.ai: Fullstream AI • Turbomachinery Digital Solutions • Valvelife Cycle • Sabio™ Log-From-Anywhere service • Sabio™ Drilling Insights service • Sabio™ ProductionLink service
• ARGOS™ 3D fracture prediction and stimulation modeling software • JewelSuite Subsurface Modeling Software • engageSubsea • Bently Nevada's System1 • LUMEN • Flare.IQ • Cybersecurity
• Avitas Systems • I.Q.uity • Phantom View • VitalyX Lubricant Oil Monitoring • Druck's 4Sight2 Calibration Management • Predictive Corrosion Management • Rhythm Insight Industrial X-Ray Suite
• Bit Vision • Perfect Well

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Oilfield Services (OFS)

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Oilfield Services (OFS)

Delivering better efficiency, better production, and better ultimate recovery to drive customer success

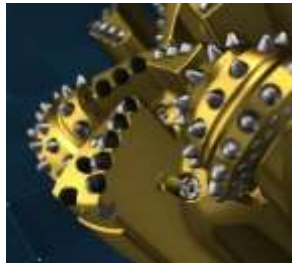
- 30,000+ employees
- Operating in 120 countries
- 143 manufacturing facilities
- 734 local offices
- 1,500+ technology professionals

Enabling lower cost per barrel for the life of the well

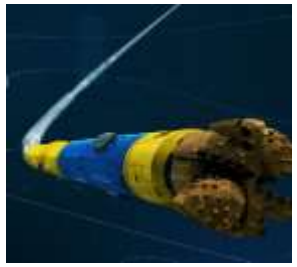

Artificial lift systems

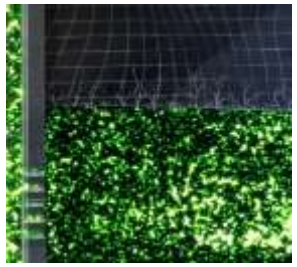

Oilfield & industrial chemicals


Completions & well intervention


Drill bits


Drilling & completion fluids


Drilling services


Pressure pumping


Wireline services


Integrated well services

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OFS product & service portfolio







Evaluation

- Logging & Coring
- Reservoir Software
- Geoscience & Petroleum Engineering
- Reservoir Consulting Services

Drilling

- Drill Bits
- Drilling Services
- Drilling & Completion Fluids
- Well Construction
- Well Intervention

Completions

- Well Construction
- Production Enablement
- Lower Completions
- Upper Completions
- Well Intervention

Production & optimization

- Artificial Lift
- Production Monitoring
- Production Chemicals
- Intelligent Production Systems
- Well Intervention
- Production Logging

Pipeline

- Drag-Reducing Agents

Refining

- Process Chemicals
- Fuel Additives
- Water Treatment

Petrochemical & fertilizer processing

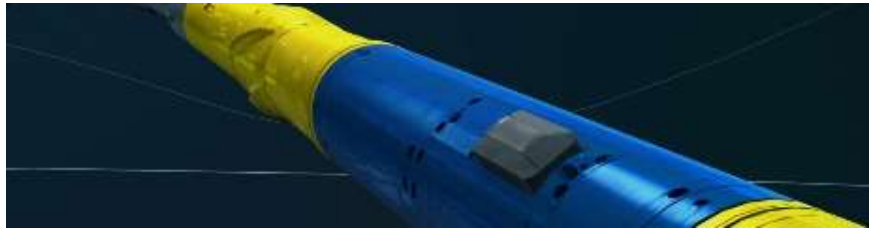
- Process Chemicals
- Water Treatment

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Baker Hughes

Drilling services

Baker Hughes comprehensive drilling solutions—from high-performance motors and rotary steerable systems to a comprehensive line of LWD and MWD offerings – and advanced application engineering services help operators hit the sweet spot precisely, efficiently and safely, regardless of the downhole environment. These offerings enable customized drilling campaigns that maximize the value of an operator's assets by increasing production and decreasing risk.



Directional drilling services

Superior directional drilling technology includes the industry's most advanced rotary steerable systems; high-performance drilling motors, reliable hole-enlargement technology, and detailed measurement-while-drilling data.



Logging-while-drilling services

LWD offerings range from gamma and resistivity services; detailed nuclear measurements; high-definition wellbore imaging; acoustic logging; deep-reading azimuthal images for precise reservoir navigation; and formation pressures and sampling.



Surface logging services

Surface logging services include geological services; critical gas monitoring and analysis; real-time fluids monitoring to minimize HSE risks; highly efficient core capture and retrieval; and 24/7 real-time operations monitoring.



Geoscience services

Geoscience services include the detailed reservoir characterization; precise wellbore positioning services, reliable geomechanicas analysis and pressure management, and comprehensive production monitoring.

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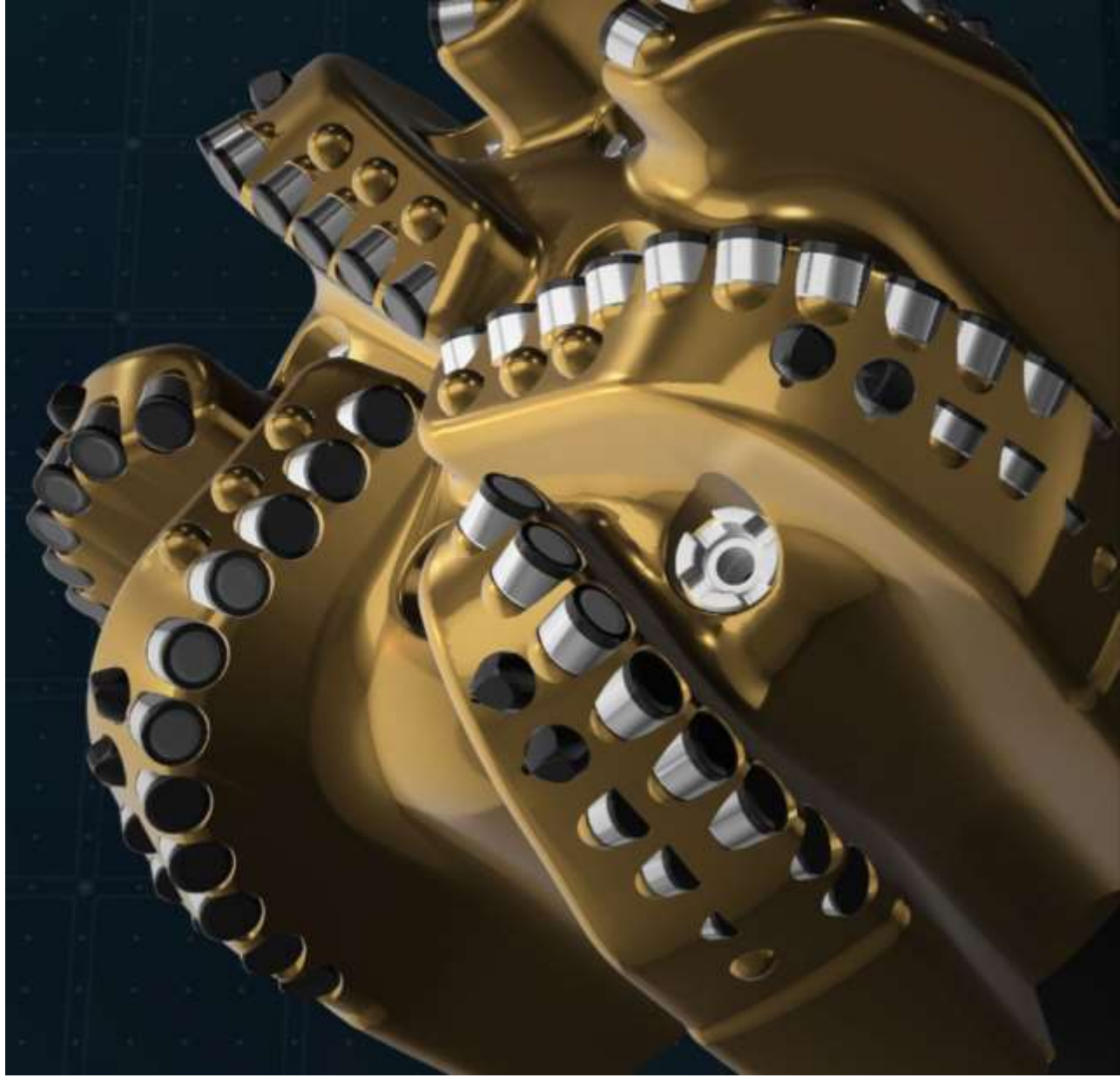
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Drill bits

The drill bits product line helps operators drill faster, farther, and more efficiently to reduce cost-per-foot in every drilling application. Technology innovations are based on extensive research, expert input from cross-functional teams, software modeling, and proprietary testing labs.

Product categories

- Polycrystalline diamond composite (PDC) drill bits
- Roller cone drill bits
- Hybrid drill bits



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Drill bits

Key technologies

- TerrAdapt™ **adaptive drill bit**
  Stop stick-slip and reduce drilling costs using the industry's only self-adjusting bit
- Kymera™ **Mach 4 hybrid drill bit**
  Get smooth, consistent drilling performance by combining the strengths of PDC and tricone bits
- Dynamus™ **extended life drill bit**
  Reduce lateral vibrations and trips in extreme drilling operations with a bit that's built to last



Manufacturing facilities

- The Woodlands, Texas, USA
- Dhahran, Saudi Arabia



R&D facilities

- The Woodlands, Texas, USA
- Dhahran, Saudi Arabia
- Beggs, Oklahoma, USA
- Pune, India
- Kochi, India

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Drilling and completion fluids

The drilling and completion fluids product line helps operators maintain wellbore stability and safety. Absolutely essential to production optimization, these fluids technologies are developed with a focus on downhole performance and operational efficiency.

Product categories

- Emulsion fluids
- Water-based fluids
- Specialty drilling fluids
- Drill-in fluids
- Waste management
- Completion fluids



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Drilling and completion fluids

Key technologies

- DELTA-**TEQ™ low**-pressure impact, high-performance drilling fluid system
  Drill with a thin fluid that won't sag, no matter the temperature
- EPI portfolio of high-performance, localized OBM components
  Get local, reliable, high-performance fluids, anywhere in the world
- MAX-**PRIME™ drilling fluid for** openhole completions and injectors
  Protect the reservoir in depleted zones and troublesome shales



Manufacturing facilities

- Morgan City, Louisiana, USA
- Houston, Texas, USA
- Corpus Christi, Texas, USA
- Battle Mountain, Nevada, USA



R&D facilities

- Houston, Texas, USA
- Beggs, Oklahoma, USA

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Drilling services

The drilling services product line offers high-performance motors and rotary steerable systems, as well as a comprehensive line of LWD and MWD offerings. Its advanced application engineering services help operators hit the sweet spot precisely, efficiently, and safely, regardless of the downhole environment. These offerings enable customized drilling campaigns that maximize the value of an operator's assets by increasing production and decreasing risk.

Product categories

- Directional drilling systems
- Logging-while-drilling systems
- Surface logging systems
- Geoscience services



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Drilling services

Key technologies

- AutoTrak™ **rotary steerable system**
  Maximize production and reduce economic risk with precise steering control
- GaugePro™ **Echo on**-command digital reamer
  Control and confirm reamer operations in real time, eliminate dedicated rathole trips, and improve operational efficiency
- VisiTrak™ **reservoir navigation and analysis service**
  See your reservoir up to 100 ft from the wellbore
- FASTrak™ **fluid analysis sampling and testing service**
  Get the volume and quantity of fluid samples you need—without compromise



Manufacturing facilities

- Celle, Germany
- Oklahoma City, Oklahoma, USA



R&D facilities

- Celle, Germany
- Dhahran, Saudi Arabia
- Beggs, Oklahoma, USA
- Delft, Netherlands
- Novosibirsk, Russia
- San Ramon, California, USA
- Kochi, India

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AutoTrak™ rotary steerable systems

Continuous proportional steering delivers a smooth, in-gauge hole.

How does it help?

Customized, customer-specific text to be inserted in this area.

Main product advantages

- Unsurpassed hole quality
- Exact well placement
- Enhanced drilling performance

Who is already using AutoTrak™?

Customized, customer-specific text to be inserted in this area.

What's the availability?

Customized, customer-specific text to be inserted in this area.



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AutoTrak™ rotary steerable systems—in depth

Maximize production and reduce economic risk with precise steering control

AutoTrak™ technology reduces the uncertainty of drilling away from the target, which minimizes economic risk, and ensures your well starts on-schedule and stays on-budget.

Unsurpassed hole quality

Using precision-controlled pads that maintain a continuous proportional steering vector, AutoTrak systems drill a smooth, in-gauge hole.

Enhanced drilling performance

AutoTrak systems use internal hydraulics to power independent ribs mounted on a decoupled, slowly rotating sleeve, so their steering control is not affected by drilling dynamics. As a result, the systems operate independently of bit pressures, flow rates, and drilling fluid properties—allowing you to optimize your bit and program design to formation challenges.

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AutoTrak™ rotary steerable systems—specifications

Get the superior performance you expect

- Use real-time logging to monitor geologic changes
- Monitor near-bit inclination every millisecond
- Make minute (± 0.1° inclination) course adjustments every second, when needed
- Use proportional steering to proactively adjust the well path

AutoTrak eXact Rotary Steerable drilling system	The AutoTrak™ eXact™ rotary steerable drilling system combines high-BUR drilling with the collection of LWD data to help operators maximize production and minimize risk.
AutoTrak Curve Rotary Steerable system	The AutoTrak™ Curve rotary steerable system provides fewer days on well, exact wellbore placement, and faster landing drilling in unconventional plays.
AutoTrak G3 Rotary Steerable system	Our rotary steerable drilling system allows you to navigate precisely into the target using superior directional control in the most challenging well profiles.
AutoTrak X-treme Rotary Steerable system	Our rotary steerable drilling system integrates a precontoured, high-power X-treme mud motor into the AutoTrak rotary steerable BHA, for additional power and RPM at the bit.
AutoTrak eXpress Rotary Steerable system	Reduce drilling time using cost-effective technology that offers the same precise, accurate performance as our other AutoTrak systems.
AutoTrak V Rotary Steerable system	Our vertical rotary steerable system saves you money by eliminating the correction runs often required with motors. Maintain a vertical wellbore with minimal surface setup.

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VisiTrak™ reservoir navigation and analysis service

The BHGE VisiTrak™ reservoir navigation and analysis service visualizes more of the reservoir, so operators know exactly where they are and where they need to go in order to build a better well.

How does it help?

Customized, customer-specific text to be inserted in this area.

Main product advantages

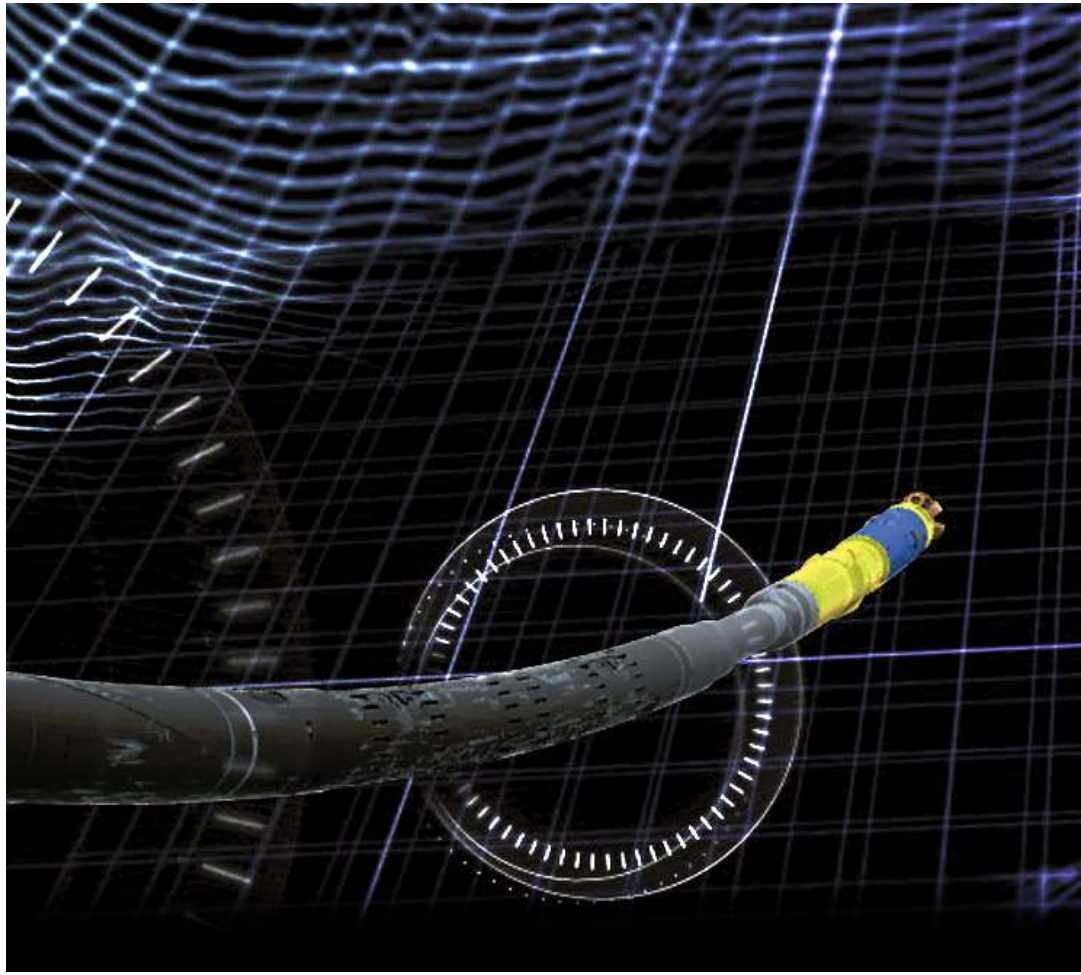
See 100 ft away from the well, to navigate precisely and efficiently.

Who is already using VisiTrak™?

Customized, customer-specific text to be inserted in this area.

What's the availability?

Customized, customer-specific text to be inserted in this area.



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VisiTrak™ reservoir navigation and analysis service—in depth

Build a better, long-term recovery plan, for higher overall profits

When you can see 100 feet into the reservoir, you can map approaching beds, boundaries, and pay zones—so you can design a completion and field management plan that maximizes long-term production potential.

Land your well more efficiently

With conventional logging while drilling (LWD) mapping and navigation technology, you can see only about 20 feet away from the wellbore. Because the VisiTrak service can map the reservoir up to five times that distance in real time, you don't need to drill costly pilot holes to confirm the top and bottom of the reservoir. Or worry about coming in too low or too high and having to spend unnecessary time steering back into the reservoir.

Find the sweet spot and stay in it longer

Finding the sweet spot and staying there means more production and greater return on investment. The advanced navigation technology behind our VisiTrak service lets you identify the optimal producing zone and helps you avoid early exits—keeping you in the sweet spot longer.

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VisiTrak™ reservoir navigation and analysis service—specifications

Visitrack™ is based on more than an decade of reservoir navigation experience

- Incorporates unique LWD technology
- Gives you visibility up to 100 ft (30 m) from the wellbore into the formation—five times farther than conventional sensors
- Reduces well costs by eliminating pilot holes
- Lets you pinpoint the most productive pay and drill it to total depth (TD)

Mechanics of the service	• Utilizes low frequency measurements (electromagnetic signals) for extra deep investigation • Utilizes cross component antenna technology allowing azimuthal sensitivity • Utilizes proprietary multi-component inversion • techniques in real time to provide informed answers while drilling
Well placement	• Pre-well modeling service based on client offset data to predict possible responses and possible decision points • Reservoir navigation SMEs utilize the next generation of proprietary navigation software to deliver a full interpretation in complex geological scenarios • Delivers Rv, Rh properties independently for each layer
Reservoir mapping	• Provides 1D optimum earth model in real time delivering thicknesses and dip for each layer detected • Real-time 3D visualization for better visual and spatial understanding • Provides 2D grids designed for geological model update

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Oilfield and industrial chemicals

The oilfield and industrial chemicals product line offers chemical services and technology solutions for the hydrocarbon production, transmission, and processing industries, as well as for other consumer-focused markets. Our relentless focus on innovation and superior service allows us to continuously deliver value-added solutions to our customers.

Product categories

- Upstream chemicals
- Downstream chemicals
- Well chemical services
- Aquaness wholesale chemicals
- Specialty polymers



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Oilfield and industrial chemicals

Key technologies

- **TRETOLITE™ SNAP fluids separation** technologies
  Achieve superior oil and water separation while optimizing operations and lowering costs
- **FORSA™ flow assurance chemical solutions**
  Proactively manage risks to keep production flowing—safely and efficiently
- **TOPGUARD™ corrosion control solutions**
  Manage overhead corrosion to extend equipment run life and prevent unplanned shutdowns
- **SULFIX™ hydrogen sulfide (H_2S) scavengers**
  Mitigate H2S gas in crude oil, intermediates, and refined products to ensure safe operations



Blend plants

- Braeside, Australia
- Mendoza, Argentina
- Labuan, Malaysia
- Calgary, Alberta, Canada
- Leduc, Alberta, Canada
- Mt. Pearl, Newfoundland, Canada
- Dammam, Saudi Arabia
- Rayne, Louisiana, USA
- Kilgore, Texas, USA
- Bakersfield, California, USA



Reaction plants

- Pasadena, Texas, USA
- Taft, California, USA
- Barnsdall, Oklahoma, USA
- Sand Springs, Oklahoma, USA
- Kirkby, Liverpool, UK



R&D facilities

- Sugar Land, Texas, USA
- Kirkby, Liverpool, UK
- Houston, Texas, USA
- St. Louis, Missouri, USA
- Tananger, Norway

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Pressure pumping (outside U.S.)

The pressure pumping product line helps operators increase access to proven reserves while improving asset value and ROI.

Product categories

- Hydraulic fracturing services
- Offshore stimulation services
- Acidizing and acid fracturing services
- Cementing services
- Coiled tubing services
- Tubular services



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Pressure pumping (outside U.S.)

Key technologies

- TeleCoil™ **intelligent coiled tubing services**
  Eliminates uncertainties associated with traditional coiled tubing operations by providing operators with accurate downhole information in real time
- **Sorb™ solid inhibitors**
  Efficiently inhibit downhole deposition or tubular damage as the well produces with a family of slow-releasing and long-lasting solid specialty chemicals
- Set-For-**Life™ cement systems**
  Ensure zonal isolation for the life of the well with cementing systems customized for specific wellbore conditions and environments



Manufacturing facilities

- Celle, Germany



R&D facilities

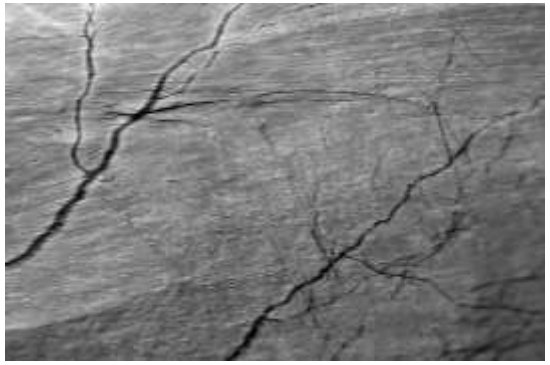
- Tomball, Texas, USA
- Calgary, Alberta, Canada
- Dhahran, Saudi Arabia

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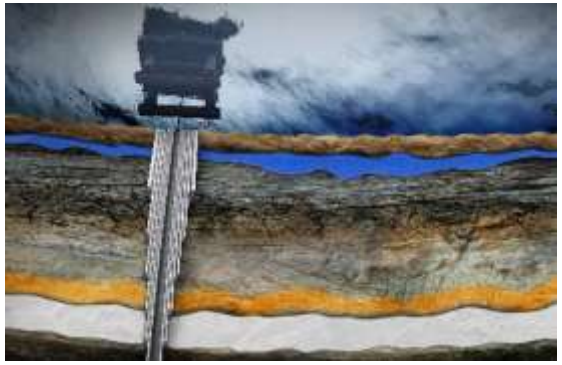
Pressure pumping

Baker Hughes' pressure pumping services help operators increase access to proven reserves while improving asset value and ROI.



Production enhancement services

Production enhancement services maximize well productivity with effective, application-specific solutions. Services combine proppants, fluids, acids, diverters, and pumping technology—including advanced offshore stimulation vessels—with a formal workflow and better knowledge management systems.



Cementing services

Cementing services provide optimized cement systems and automated mixing equipment that enable precise slurries to deliver safe, reliable zonal isolation. The portfolio includes products and services for conventional, HPHT, lightweight, and corrosive applications.



Coiled-tubing services

Coiled-tubing solutions include cleanouts, stimulation, fishing, and perforating, and offer intelligent options for downhole data transmission and acquisition. Coiled tubing services enable operators to intervene without having to kill the well or pull the production string. These proven services save time and control intervention costs.

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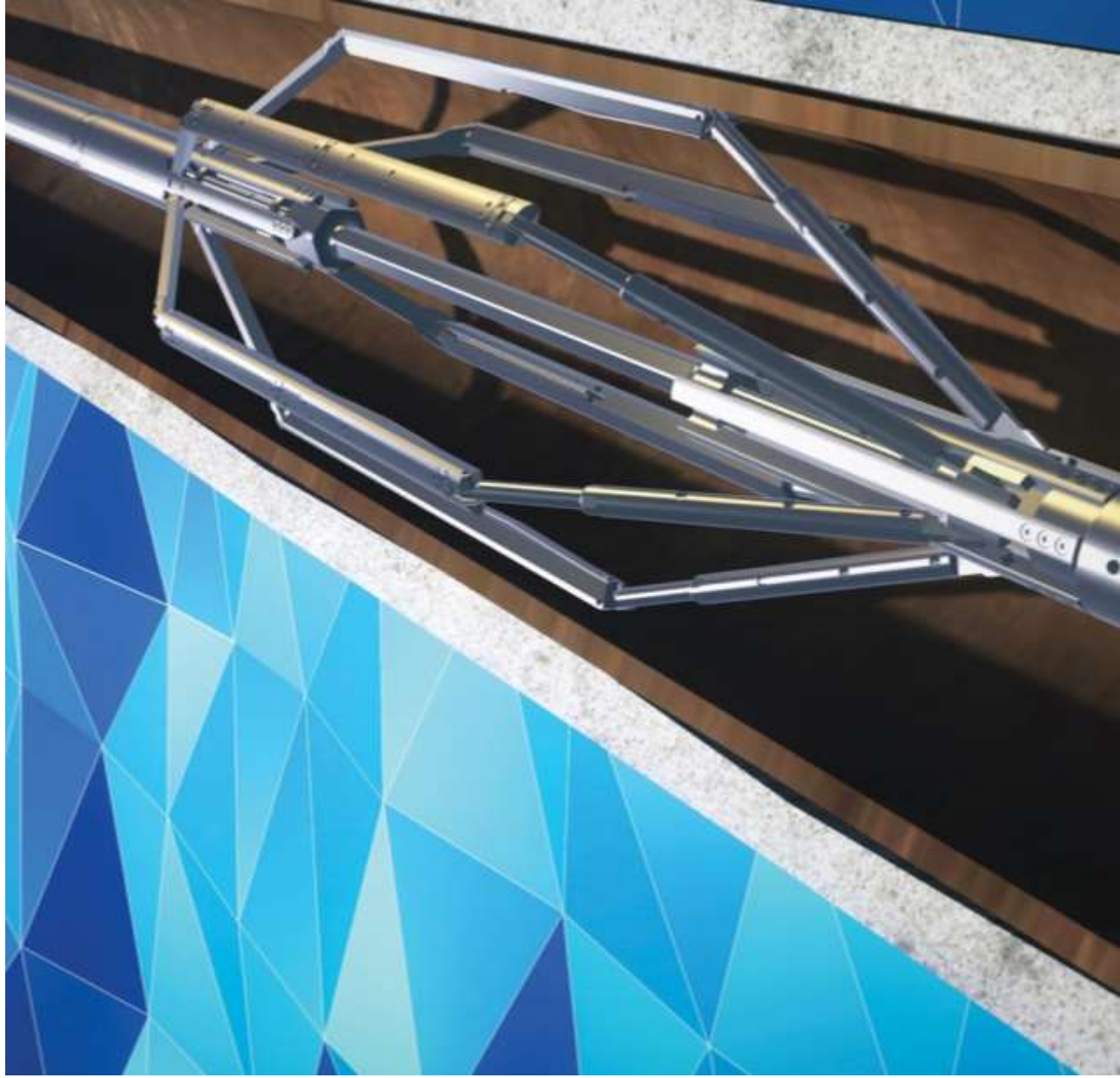
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Wireline services

The wireline services product line offers a complete range of downhole well logging technology and services for every environment to help operators achieve a better understanding of their formations so they can find and extract hydrocarbons more efficiently and economically.

Product categories

- Openhole logging services
- Cased-hole logging services
- Perforating services

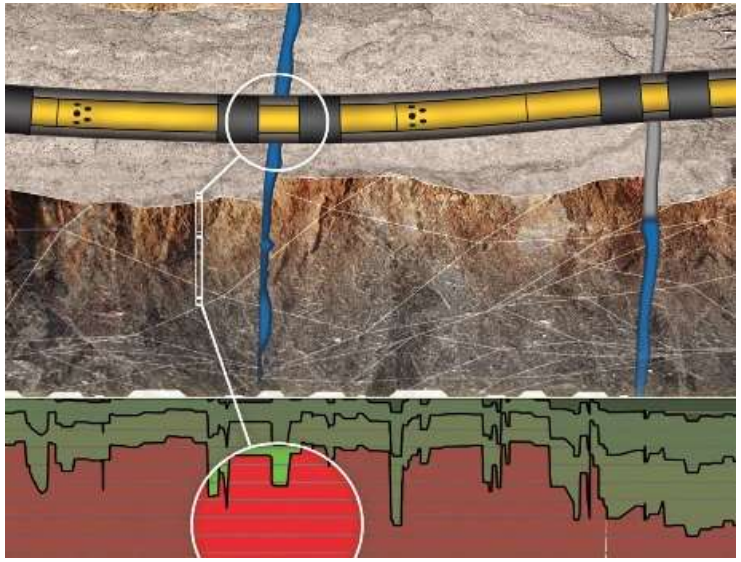


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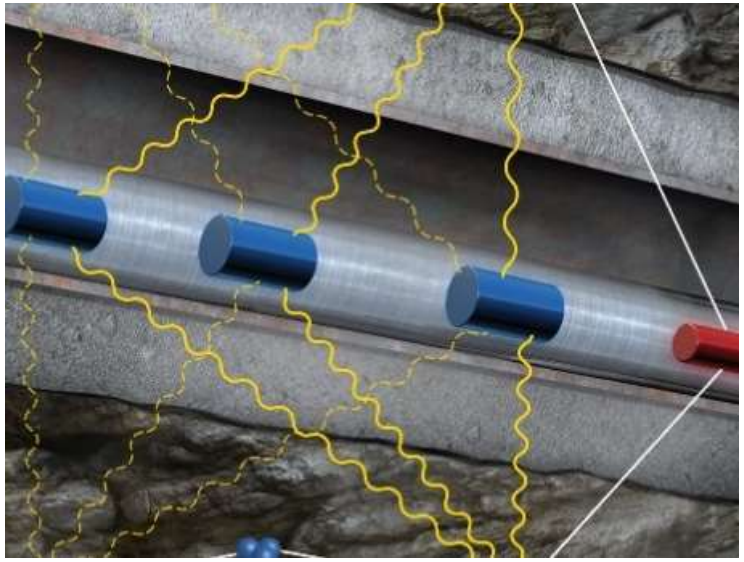
Wireline services

Baker Hughes' wireline services help operators achieve a better understanding of their formations in order to find and extract hydrocarbons more efficiently and economically. The product line offers a complete range of downhole well logging services for every environment.



Open-hole wireline services

Open-hole wireline services provide operators with advanced formation evaluation and production and reservoir monitoring.



Cased-hole wireline services

Cased-hole wireline services deliver fit-for-purpose technology that solves an operator's most critical evaluation needs including advanced formation evaluation, production and reservoir engineering, and petrophysical and geophysical data-acquisition services.

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Wireline services

Key technologies

- Array Dielectric eXplorer™ **formation evaluation service**
  Get key formation data to improve hydrocarbon reserve estimates
- Integrity eXplorer™ **cement evaluation service**
  Better understand cement bond to make critical downhole decisions – even in light-weight, contaminated cement
- FTeX™ **advanced wireline formation pressure testing service**
  Acquire real-time pressure data accurately, efficiently, and reliably



Manufacturing facilities

- Houston, Texas, USA
- Lafayette, Louisiana, USA
- Hempstead, Texas, USA
- Farnborough, UK



R&D facilities

- Houston, Texas, USA
- Farnborough, UK
- Novosibirsk, Russia

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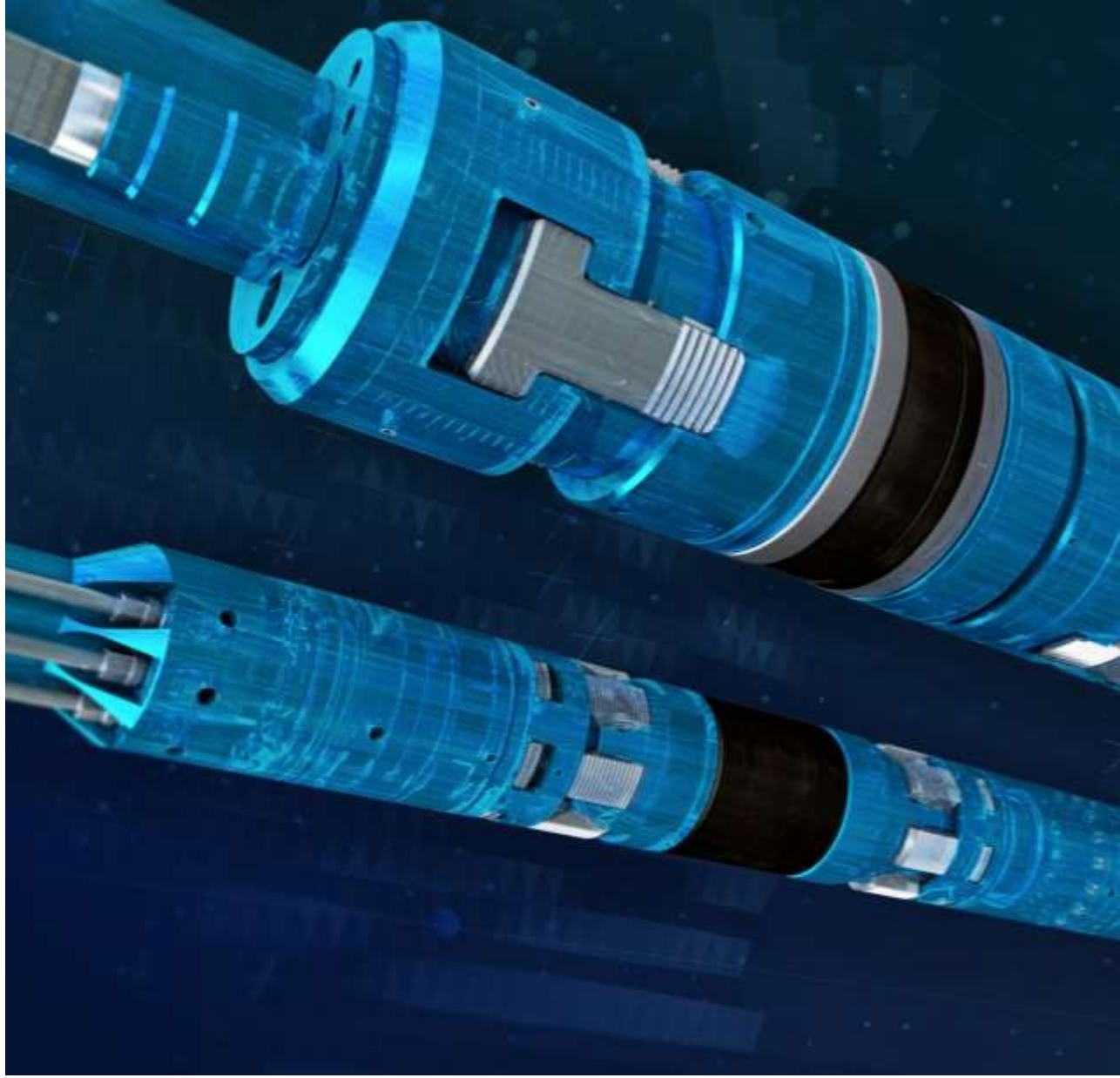
Baker Hughes

Completions and well intervention

The completions and well intervention product line helps operators create and maintain a reliable production conduit and maximize hydrocarbon flow across the life of the well. The comprehensive portfolio improves recovery while minimizing intervention-related NPT—from first oil to final abandonment.

Product categories

- Wellbore construction
- Upper completions
- Lower completions
- Unconventional multistage completions
- Intelligent production systems
- Well intervention



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Baker Hughes

Completions and well intervention

Key technologies

- FLEX-**LOCK™ V liner hanger system**
  Hang exceptionally heavy liners with minimal stress on the casing
- DeepShield™ deepwater subsurface safety valve
  Ensure fail-safe protection in critical offshore completions
- SureSENS™ **QPT ELITE permanent downhole gauge**
  Get reliable data in extreme downhole conditions
- SureVIEW™ **fiber**-optic well monitoring system
  Drive better production decisions and increase recovery with accurate downhole data
- **STONE WALL™ V0**-rated well barriers
  Achieve reliable, gas-tight isolation
- **DEEPFRAC™** deepwater multistage fracturing system
  Transform the efficiency—and the economics—of offshore completions



Manufacturing facilities

- Houston, Texas, USA (3 locations)
- Pine Island, Texas, USA
- Blacksburg, Virginia, USA
- Broken Arrow, Oklahoma, USA
- Oxford, UK
- Bridge of Don, Scotland, UK
- Leduc, Alberta, Canada
- Dubai, UAE
- Singapore



R&D facilities

- Houston, Texas, USA (5 locations)
- Blacksburg, Virginia, USA
- Broken Arrow, Oklahoma, USA
- Bossier City, Louisiana, USA

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Completions and well intervention

Baker Hughes' completion solutions help operators create the ideal conduit from formation to surface to maximize production, reduce intervention cost, and extend the life of the well—regardless of the depth, reach, temperature, or pressure requirements.

Our well intervention services help operators clean and remove debris before completion; safely suspend production during storms or planned maintenance; conduct remediation and stimulation to rejuvenate production; sidetrack existing wells to reach new targets; and carry out safe and effective plug and abandonment at the end of the well's economic life.



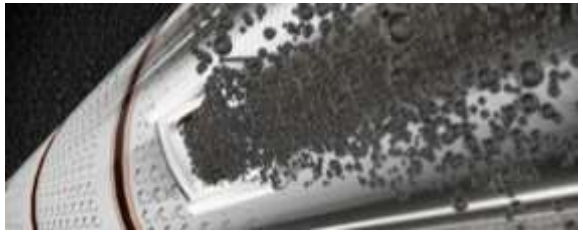
Wellbore construction

Wellbore construction solutions help operators reduce capital expense and minimize risk.



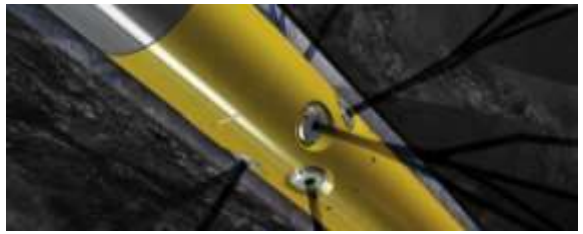
Upper completions

Solutions for upper completions help operators maintain reliable well control and manage flow.



Lower completions

Solutions for lower completions optimize long-term production and recovery through maximized reservoir connectivity, enhancement, and conductivity.



Unconventional multistage completions

Solutions for multistage completions improve completion efficiency and maximize reservoir contact.



Intelligent production systems

Intelligent production systems provide the data, insight, and control customers need to make effective production decisions. The focus is on using data to optimize production, increase ultimate recovery, and reduce total cost of ownership.



Well Intervention services

Well intervention services include wellbore cleanup, fishing services. casing exits, thru-tubing intervention, inflatable systems, service tools, coiled-tubing stimulation systems, and smart intervention systems.

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DENIZEN™ Coiled Tubing System (CTS)

- Experience in all deep water arenas around the world
- Deployment skid and over boarding structure specifically designed for pipeline pre-commissioning applications
- Can be used to flood and hydrotest from the surface to the deep water pipeline, delivering the required fluids and compressed gases required during pre-commissioning.
- Reduce vessel time and cost by performing flooding and hydrotesting operations on the seabed.
- DNV certified lifting frames



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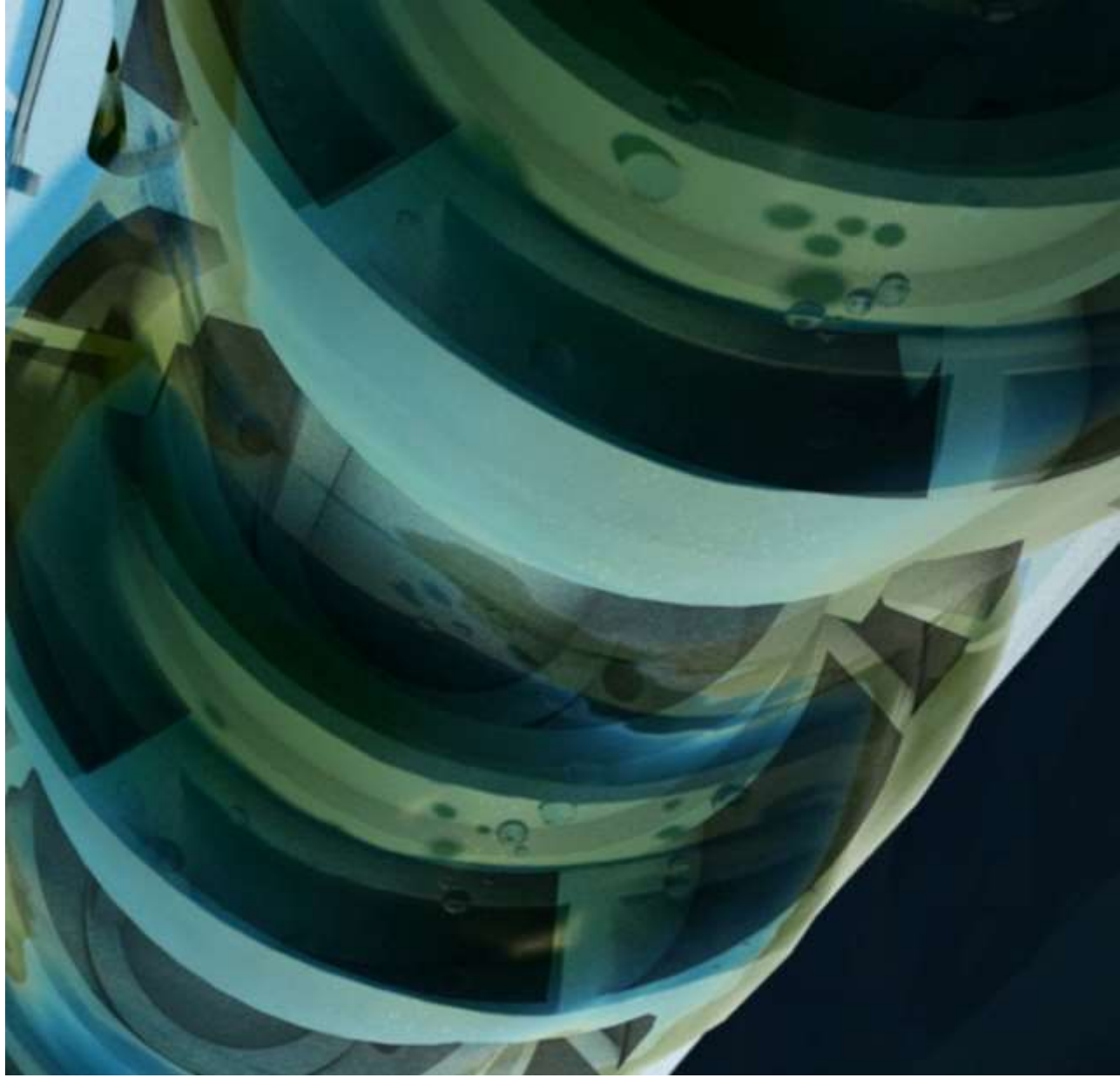
Baker Hughes

Artificial lift systems

The artificial lift product line offers the industry's most complete portfolio of artificial lift solutions, designed to maintain production and maximize reserve recovery for the life of a well. These flexible solutions allow operators to tailor production decisions to their specific technical challenges, business objectives, and reservoir requirements.

Product categories

- Electrical submersible pumping systems
- Rod lift systems
- Surface pumping systems
- Progressing cavity pumping systems
- Gas lift systems



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Artificial lift systems

Key technologies

- TransCoil™ rigless-deployed ESP system
  Eliminate the need for a rig to lower intervention costs and to minimize deferred production
- CENesis **PHASE™ multiphase encapsulated** production solution
  Separate gas slugs before they enter the ESP system to eliminate production interruptions
- CENtigrade™ **extreme**-temperature ESP system
  Improve production and up time in heavy oil thermal recovery projects
- FLEXPump™ **series pumps**
  Extend the operating range of ESP systems to reduce change outs as production rates decline



Manufacturing facilities

- Claremore, Oklahoma, USA
- Tulsa, Oklahoma, USA
- Missouri City, Texas, USA
- Lufkin, Texas, USA
- Red Deer, Alberta, Canada
- Mendoza, Argentina
- Comodoro Rivadavia, Argentina
- Tyumen, Russia
- Inverurie, Scotland, UK
- Ploiesti, Romania
- Dongguan, China
- Tianjin, China
- Hsinchu, Taiwan
- Bang Bung, Thailand
- Dammam, Saudi Arabia



R&D facilities

- Claremore, Oklahoma, USA
- Oklahoma City, Oklahoma, USA
- Celle, Germany
- Inverurie, Scotland, UK

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Artificial lift systems

Baker Hughes offers a wide range of artificial lift solutions designed to maintain production and maximize reserve recovery over the life of a well. These solutions give operators the power to exploit the value of their assets through flexible production solutions that align with their specific business objectives and reservoir requirements.



Electrical submersible pumping systems

Baker Hughes' technologically advanced and reliable electrical submersible pumping (ESP) systems provide effective, efficient pumping capabilities to maximize production and ultimate reserve recovery in wells with benign to harsh downhole environments.



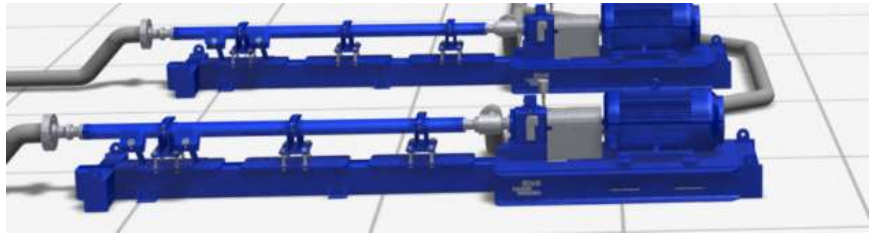
Gas lift systems

Gas lift systems extend production from wells with high gas-to-liquid ratios by injecting gas into the fluid stream through values located on tubing retrievable mandrels or side pocket mandrels.



Progressing cavity pumping systems

Progressing cavity pumping (PCP) systems offer effective pumping solutions to reliably improve production from low-volume wells, heavy oil fields, coal seam gas wells, and for wells with high levels of gas and / or abrasives entrained in the production stream



Surface pumping systems

Horizontal surface pumping systems combine proven, reliable, modular pumping technology with expert service and operational efficiency to reduce maintenance costs, minimize down time, improve pumping performance, and mitigate environmental risks for a wide range of applications



Rod lift systems

Rod lift systems are a flexible, effective, and affordable artificial lift option that extends the life of producing assets by pumping a well down to very low reservoir pressures and production rates. Baker Hughes rod lift technology advancements, including automation capabilities, are extending the application of this workhorse of the oil field.

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Integrated Well Services

The Integrated Well Services (IWS) business offers scalable turnkey solutions that maximize the value of an operator's assets through project management, well engineering, field supervision, risk management and contractor management. Focused on operational excellence with safe and cost-effective outcomes, IWS leverages technology solutions, digital platforms and Baker Hughes' global footprint.

Product categories

- Project management
- Well construction
- Well intervention
- Production services
- Plug and abandonment
- Coiled tubing drilling



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Oilfield Services ongoing research



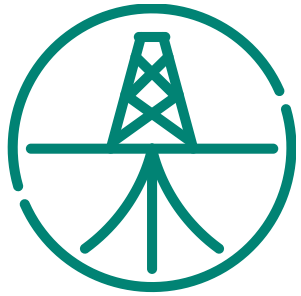
Molecular science

Model and design at micro level to create new chemicals and materials with revolutionary performance



Virtualization and automation

Network physical objects and perform data virtualization and analytics, including high-volume and high-rate data



Subsurface intelligence

Better understand the reservoir and forecast its production and reserves



Water and environmental science

Minimize fresh water usage through new methods of water and waste treatment and disposal



Advanced manufacturing technologies

Unlock new design solutions, extend operational envelope of existing products, lower costs, increase reliability and safety

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Baker Hughes

Oilfield Services global technology and research centers



The Woodlands Technology Center

The Woodlands, Texas, USA



Celle Technology Center

Celle, Lower Saxony, Germany



Center for Technology And Innovation

Houston, Texas, USA



Ginn Center

Sugar Land, Texas, USA



Houston Technology Center

Houston, Texas, USA



Artificial Lift Research and Technology Center

Claremore, Oklahoma, USA



Dhahran Technology Center

Dhahran, Eastern Province, KSA



Oil & Gas Technology Center

Oklahoma City, Oklahoma, USA

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Oilfield Equipment (OFE)

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Oilfield Equipment (OFE)

Next-generation technology, services and project management solutions designed to reduce the total cost of ownership for our customers. OFE draws from a portfolio of ultra-reliable technologies, including subsea trees, manifolds, blowout preventers (BOPs), flexible risers and advanced control systems.

- 8,000+ employees
- Global presence in all regions, including: Africa, Middle East, Asia Pacific, Europe, and the Americas
- 14 manufacturing facilities
- 16 service facilities



Subsea

- Subsea projects
- SPS installation
- Wellhead systems
- Trees
- Manifolds & connection systems
- Control systems
- Power & processing
- Specialty connectors & pipe
- Flexible pipe systems
- Floating production systems
- Integrated services and solutions
- Decommissioning



Drilling

- Offshore & onshore drilling systems
- Rig drilling services
- Blowout preventers
- Control systems
- Marine riser systems
- Elastomer products & spare parts
- Aftermarket/field services



Surface

- Surface trees
- Wellhead systems
- Flow control
- Field service
- Shale 360™

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OFE product & service portfolio



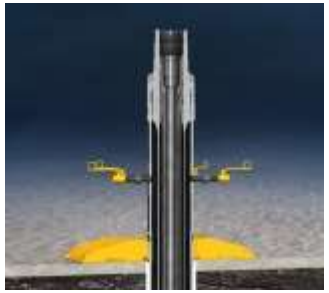
Subsea projects

- Engineering studies
- Field development planning



Subsea & surface drilling systems & services

- BOP systems
- BOP control systems
- Annular BOP systems
- RAM BOP systems
- Diverters
- Pulsation dampeners
- Choke and valves
- EngageDrilling services
- NDT BOP inspection technology



Surface pressure control

- Subsea wellheads and tubulars
- Specialty connectors and pipe
- Floating production systems
- Flow control valves and actuators
- Shale 360™ services



Subsea production systems

- Subsea trees
- Subsea production control system
- Subsea manifolds & pipeline products
- Subsea connection systems
- Subsea power & processing
- Installation and commissioning



Flexible pipe systems

- Dynamic flexible pipes
- Static flexible pipes
- Flexible pipes integrity management systems
- Installation and commissioning



Integrated services & solutions

- Production enhancement
- IWOCS solutions
- Brownfield solutions



Decommissioning

- Turnkey plug & abandonment
- Well access equipment rental
- Downhole services

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Oilfield Equipment markets served

We operate in 120 countries across 7 regions (Europe; Russia & CIS; Africa, Middle East & India; Asia Pacific & China; North America; and Latin America)

Upstream



Subsea

- Subsea projects
- SPS installation
- Wellhead systems
- Trees
- Manifolds & connection systems
- Control systems
- Power & processing
- Specialty connectors & pipe
- Flexible pipe systems
- Floating production systems
- Integrated services and solutions
- Decommissioning



Drilling

- Offshore & onshore drilling systems
- Rig drilling services
- Blowout preventers
- Control systems
- Marine riser systems
- Elastomer products & spare parts
- Aftermarket/field services



Surface

- Surface trees
- Wellhead systems
- Flow control
- Field service
- Shale 360™

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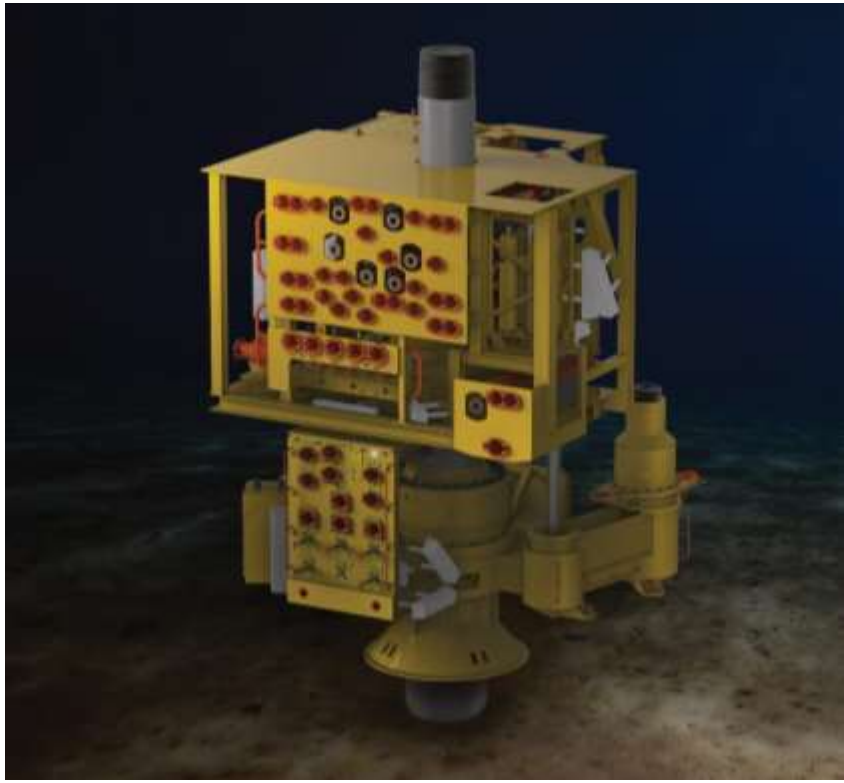
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DVXT Deepwater Vertical Tree System

The DVXTTM tree provides a structured, modular approach that shortens the delivery cycle, while increasing overall quality and engineering focus on the most important and unique project challenges.

How does it help?

- Enables BOP-on-tree operations or in open water using OWRT
- Optional tree cap installation through BOP
- Retrievable flow control module



Main product advantages

Increases efficiency and quality at every stage, from shorter delivery cycles, to enhanced reliability

What's the availability?

Adaptable modular system, installed by simple support vessel, tree mandrel can accommodate drilling BOP or completion riser.

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DVXT™ Deepwater Vertical Tree System—In depth

Designed to take on the **world's most challenging** deepwater conditions

DVXT delivers, with an installation depth up to 3,000 m; operating pressures of 10,000 and 15,000 psi; and an operating temperature range of -18°C to +151°C.

Perform all work from your vessel

The DVXT is designed for quicker, more frequent well access, for cost-effective maintenance regardless of water depth. Deployed with the SemStar5-R, the DVXT incorporates the latest in communication technology and is designed with the objectives of higher subsea reliability, extended service life, and improved environmental monitoring.

Modular system

The DVXT's structured, modular design approach shortens the delivery cycle, while increasing overall quality and engineering, allowing us to focus on the most important and unique project challenges.

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DVXT™ Deepwater Vertical Tree System— Specifications

Flexible designs and modular components for improved performance

Master valve block configured for 13 downhole functions, including well safety valves and chemical injection.

Features	5" x 2" 10,000 psi deepwater, monobore vertical tree with tubing head spool (THS), enables BOP-on-tree operations or in open water using OWRT retrievable FCM
Depth rating	3,000 m
Design life	30 years
Product structuring	Maximum use of existing design
Subsea control module	Capable of 220 km offset. Structured product for optimal time to market. High availability through rigorous pre-FAT testing, ESS, temperature and hyperbaric

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Modular Compact Pump (MCP)

Enabling subsea boosting through lower cost and space requirements

Broad adoption of subsea boosting has been hampered by high CAPEX of conventional systems, and topside space and weight constraints. BHGE's new Modular Compact Pump (MCP) significantly reduces topside space requirements (by up to 50%), and simplifies the umbilical to deliver a highly cost-efficient system.

MCP is a barrier-fluidless **pump that's up to 40% lighter, meaning** smaller vessels can be used for installation and intervention.

- Modular design has independently controllable stages, with integrated motor-impellers rotating around a static central shaft. This avoids the rotordynamic issues associated with conventional pumps, as well as the need for a mechanical seal, thereby compensating for stage loss and maintaining production.
- Modules can be stacked and built into larger systems depending on process needs, with a typical pump stacking between 4 and 24 stages, providing a pumping power range of 1–6 MW.
- Part of a suite of products aimed at lowering total expenditure across the life of field, MCP is being developed under a joint industry project (JIP) with several global operators and The Research Council of Norway, through its DEMO 2000 program.



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SemStar5™ subsea electronics module

Ultra-reliability and flexibility for any communications requirements

Our fifth-generation design includes significant obsolescence management features, as well as ruggedization features extensively qualified beyond the requirements of ISO13628 Part 6.

Flexible communications options

- Fiber-optic modems (up to 1Gbit/s and up to 300 km)
- DSL modem (up to 5 Mbit/s and over 30 km)
- RS-422 (high-speed up to 800 m)
- Variable-speed multi-drop copper modems (9.6 to 115.2 Kbit/s)
- Low-speed copper modem (1.2 Kbit/s)
- Direct Ethernet (100 Mbit/s)

Enhanced reliability features

- Redundant DC power supply to internal modules and Ethernet for backplane and inter-bay communications
- Single-board computer (SBC) based on 32-bit microcontroller
- Robust internal electrical harness design
- Fewer internal wiring interconnections
- Simplified motherboards
- Built-in circuit board diagnostics
- Fault-tolerant input/output (I/O) interfaces



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Speedhead™ wellhead systems

Saving valuable rig time

Our Speedhead™ wellhead systems are designed for safe and fast installation of casing and tubing. With optimal efficiency and flexibility across a wide range of operating conditions, they deliver considerable time and cost savings compared to conventional wellhead systems.

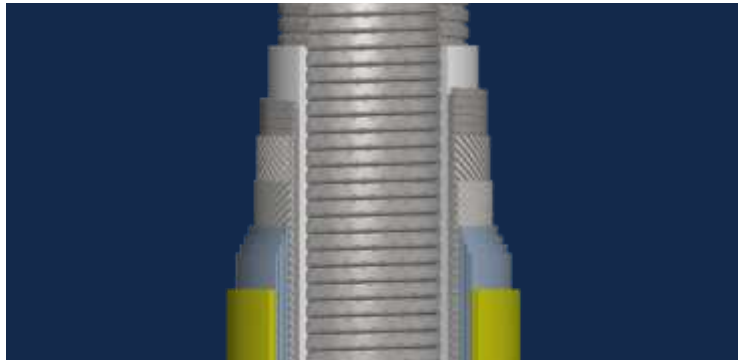
They can save anywhere from 17 to 40 hours of valuable rig time, depending on application—translating into incredible value given that US land-drilling rates range anywhere from $15,000 to $25,000 per day.

- Land Speedhead—for use as a two-stage starting head, combining the casing head and casing spool into a single housing
- Riser Speedhead—single-stage and multi-stage (multi-bowl) configurations
- SH2 Split Speedhead—multi-bowl system that supports and seals two strings of pipe in a single head
- SH3 Speedhead—lands two strings of pipe in one compact forged housing
- Offshore Speedhead—specifically designed for compatibility with drilling methods commonly used in the Gulf of Mexico.



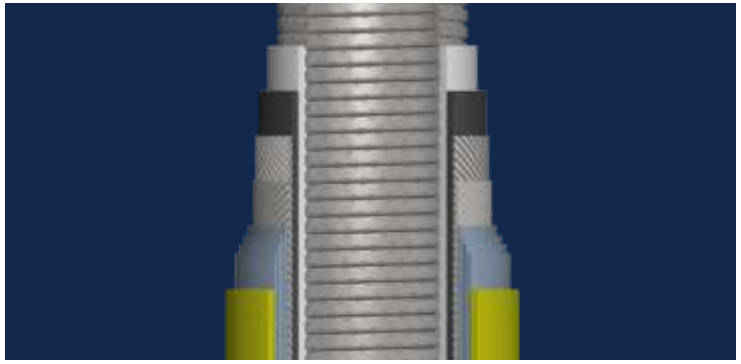
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Lower total pipeline system cost



Conventional flexible pipe

Flexible risers provide increased subsea-layout versatility, enabling the use of floating production units, and handling harsh dynamic environmental conditions. They are a particularly attractive solution for deepwater and ultra-deepwater environments.



Composite flexible pipe

This game-changing design combines all the recognized system benefits of a flexible solution with a lightweight structure ideal for deepwater and ultra-deepwater applications.

- 20% lower total installed cost vs. conventional flexibles
- 30% lighter weight vs. conventional flexibles
- Enables 15 Kpsi beyond 3,000 m
- 150˚C (300˚F) capability



MAPS™ integrity management system

Extend the life a critical risers for up to 3-5 years with our MAPS™ integrity management system, the only inspection technology with reach–the ability to detect defects several meters away from the actual inspection location.

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Baker Hughes

Turbo machinery & Process Solutions (TPS)

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Turbomachinery & Process Solutions (TPS)

Structured to serve our customers

- 10,000+ employees
- Operating across 120 countries in all Regions: Europe, Russia & CIS, Africa, Middle East & India, Asia Pacific & China, North America and Latin America
- Advanced manufacturing and services capabilities worldwide
- 15 innovation labs to enhance our additive, artificial intelligence, digital, service and materials capabilities
- A dedicated combustion lab to reduce gas turbine emissions with different fuels, including hydrogen
- 1,000 Field Service Engineers
- A Technical Training Academy & Leadership Learning Center

Portfolio

- Aeroderivative, heavy-duty and industrial gas turbines
- Gear solutions
- Steam turbines
- Centrifugal and axial compressors
- Electric-motor driven and integrated compressors
- Reciprocating compressors
- Turboexpanders and hot gas expanders
- Process, control and safety valves
- Centrifugal pumps
- Integrated solutions for CO2 reduction
- Modular solutions for compression and power generation
- Service and digital solutions
- Learning & Skills development



Onshore & offshore production



Pipeline & gas processing



Refinery & petrochemical



Industrial



Liquefied natural gas

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Baker Hughes

TPS product & service portfolio



Onshore & offshore production

In On- & Offshore applications we provide solutions for hydrocarbon production to help our customers extract, gather, treat and process resources and prepare them for delivery to midstream facilities.

Our product portfolio includes:

- Gas turbines
- Steam turbines
- Centrifugal and axial compressors
- Reciprocating compressors
- Electric-motor driven and integrated compressors
- Subsea compressors
- Process control and safety valves
- Centrifugal pumps
- Gear solutions and bearings
- Control systems
- Turnkey modules for compression and power generation
- Plant optimization apps
- Comprehensive services and support



Pipeline & gas processing

In the Pipeline & Gas Processing space, we offer a broad range of solutions in order to transport hydrocarbons and refined products from production sites to consumption territories, through various applications such as oil & gas gathering, boosting, processing and treatment, as well as their storage, metering and distribution.

Our product portfolio includes:

- Gas turbines
- Centrifugal and axial compressors
- Reciprocating compressors
- Electric-motor driven and integrated compressors
- Process control and safety valves
- Gear solutions and bearings
- Centrifugal pumps
- Control systems
- Turnkey modules for compression and power generation
- CNG for distribution applications
- Plant optimization apps
- Comprehensive services and support
- Waste heat and pressure recovery systems



LNG

In LNG we offer a broad range of technology solutions from gas liquefaction to regasification, supplying equipment and/or modules for refrigeration, power generation, flash gas/ boil-off gas compression.

Our product portfolio includes:

- Gas turbines
- Steam turbines
- Centrifugal and axial compressors
- Centrifugal pumps
- Process control and safety valves
- Gear solutions and bearings
- Control systems
- Small scale CNG and LNG
- Turnkey modules for compression and power generation
- Plant optimization apps
- Comprehensive services and support



Refinery & petrochemical

We offer a comprehensive range of solutions for the Refinery, Petrochemical and Fertilizing chemical processes, including Hydrotreating, Hydrocracking, Fluid Catalytic Cracking, Continuous Catalyst Regeneration, Ethylene, PDH, LDPE, Nitric Acid, Urea, Ammonia, Methanol, powergen and waste gas energy recovery.

Our product portfolio includes:

- Gas turbines
- Steam turbines
- Hot Gas and Turbo Expanders
- Centrifugal and axial compressors
- Reciprocating compressors
- Centrifugal pumps
- Process control and safety valves
- Air-cooled heat exchangers
- Gear solutions and bearings
- Control systems
- Turnkey modules for compression and power generation
- Waste heat and pressure recovery systems
- Plant optimization apps
- Comprehensive services and support



Industrial

For the Industrial sector we offer solutions for unconventional, conventional and renewable power generation, combined heat and power (CHP), district heating, desalination, water treatment, energy recovery, energy storage and carbon capture & storage. We serve customers in metal & mining, pulp & paper, cement, sugar, marine, food & beverage, chemicals, utilities & independent power producers.

Our product portfolio includes:

- Gas turbines
- Steam turbines
- Centrifugal and axial compressors
- Centrifugal pumps
- Process control and safety valves
- Air-cooled heat exchangers
- Gear solutions and bearings
- Control systems
- CO_2 Liquefaction
- Turnkey modules for compression and power generation
- Waste heat and pressure recovery systems
- Liquid Air and Adiabatic Compressed Energy Storage
- Plant optimization apps
- Comprehensive services and support

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Integrated Compressor Line (ICL)

Proven zero-emissions compression for industry-wide applications.

How does it help?

With its 4 million hours of successful operation over 15 years, ICL provides clean, efficient and cost- effective compression applications to an industry that has growing demands for highly efficient and clever system solutions.

Main product advantages

Proven zero-emissions compression in a compact and efficient package that's ideal for offshore platforms and other limited spaces.



GRT Gaz Etrez site, France. Photo by Philippe Dureuil

Who is already using icl?

OGE (Open Grid Europe) and TAG (Trans Austria Gasleitung GmbH)

See PR here.

What's the availability?

With 40% lower requested maintenance than conventional compressors, ICL provides exceptional reliability and availability no matter where it's Installed— while producing zero emissions.

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Integrated Compressor Line (ICL)—In depth

Small and light

By saving up to 60% in space and footprint, the ICL can reduce structure cost, avoid additional deck space requirements, or limit platform size requirements.



Proven versatility and reliability

Instead of a combustion engine, ICL has a high-speed electric motor, fully integrated with the compressor in a single sealed casing. It's a high-efficiency induction motor, proven by four million hours of successful operation over 15 years.



Zero emissions

The ICL is a clean approach to compression. There is no seal leakage from the completely closed case, no depressurization is required on shutdown, and the AMBs require no lubrication, so there are no lubricant leaks and no oil to dispose of.

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Integrated Compressor Line (ICL)—Specifications

ICL is ideal for offshore platforms and downstream facilities

- Low operating cost
- Compact and lightweight configuration
- High flexibility and wide operating range
- Easy installation and low maintenance
- Zero emissions and low noise

Offshore	• Extended capability for mild/raw gas: • Up to 10% CO_2 • Up to 100 ppm H_2S • Water saturated • New material validated for motor and AMB • Up to 100 bar suction pressure
Pipeline compression	• Design pressure ratio • 1.1 to 1.4 (up to 1.55) • Rated up to 900 lbs • High-speed drive system • 4 MW / 5,500 hp, 18,000 rpm • 6-8.5 MW / 8,000–11,000 hp, 12,000 rpm • 13 MW / 18,000 hp, 10,500 rpm
Storage and other onshore applications	• Power up to 13 MW/18,000 hp • Pressure rating up to 1,500 lbs • Flow up to 45,000 am3/h (26,000 acfm) • Multi-stage in-line or back-to-back

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API618 reciprocating compressors

The perfect mix of high reliability and low maintenance, for any application.

How does it help?

Rugged design to meet the most severe operating conditions in a wide range of petrochemical and refinery applications, customized to project requirements

Main product advantages

Renowned for low pulsation and vibration—which translates directly to exceptional efficiency, smooth operation, low maintenance, and low power consumption.

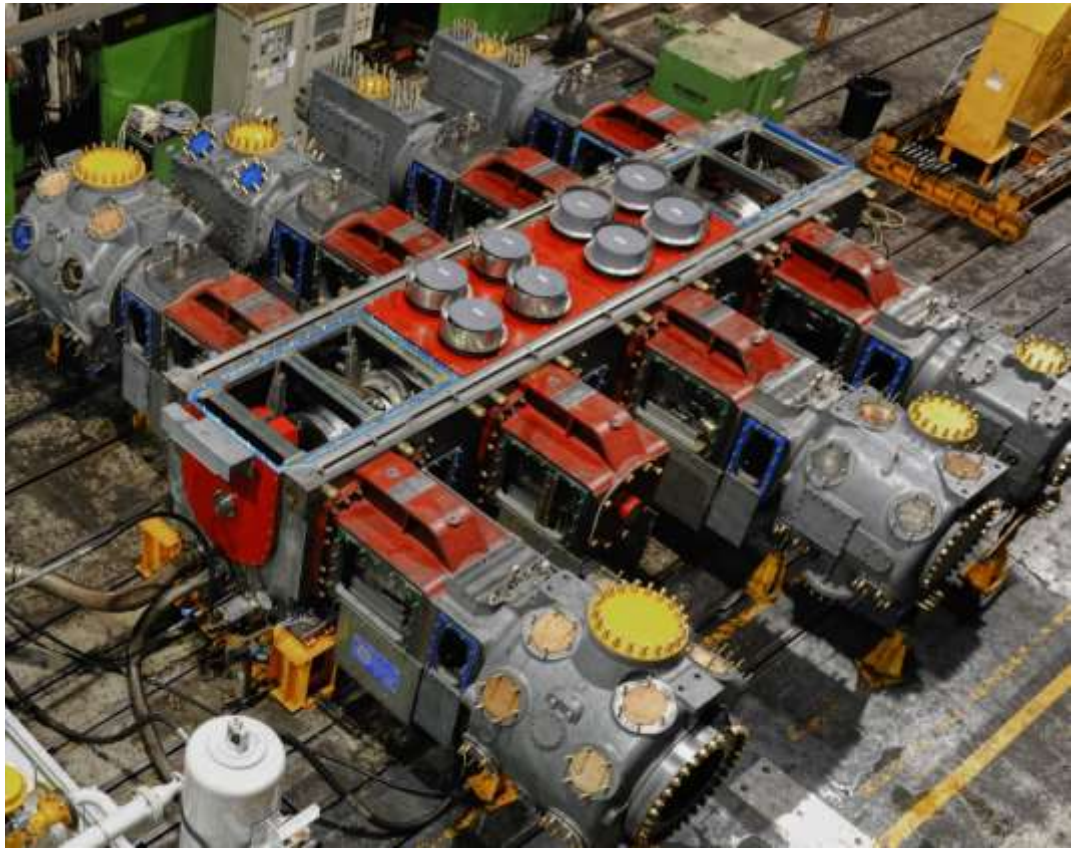
Who is already using API618 recips?

Shell, ENI, Petronas
BP,Repsol, Reliance,Exxon, Phillips,
Dow Chemichal, Sasol

What's the availability?

Available for a wide range of applications where heavy duty machines are required. Best fit for refinery and petrochemical services.

Fully balanced design available for offshore applications



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API618 reciprocating compressors—in depth

Flexible modular designs for long-term reliability and minimized costs

Used in a wide range of refinery, petrochemical and natural gas applications—including LDPE, hydrocracking, ammonia, refrigeration, re-injection and gas lift.

Proven design



Our proven modular design allows for 1 to 10 cylinders on a single frame, with a cylinder size of up to 1,250 mm. Machines range from 100 kW to 41 MW, with pressure capabilities up to 800 bar. There are 10 models to choose from with designs and materials optimized for each application.

More than 80 years of industry-leading performance



Baker Hughes API618 compressors are renowned for low pulsation and vibration—which translates directly to exceptional efficiency, smooth operation, low maintenance and low power consumption.

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API618 reciprocating compressors—specifications

The right fit for every application

No matter what the application or unique site challenges, we can supply a fully integrated solution including motor, vessels, piping, supports, and control panel.

Frame	Throws	Max power (kW)	Max rod load (kN)	Max stroke (mm)	Max speed (rpm)
OA	1	435	117	220	800
HA	2-4	2,120	145	180	1,000
HB	2-4	3,680	236	230	800
HD	2-6	7,800	322	280	700
HE	2-10	21,500	533	330	600
HE-S	2-6	15,300	670	330	800
HF	2-10	34,600	1,140	360	514
HG	2-10	41,000	1,550	400	514
SHM	2-6	7,980	358	150	1,200
SHBM	2-4	5,320	358	150	1,200

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BCL centrifugal compressor with High Pressure Ratio (HPR)

Our smallest and lightest-weight compressor yet

- Up to 50% smaller train footprint than traditional configuration
- Up to 30% lighter weight
- Up to 5% less power consumption
- Up to 3 sections (@ 2 intercoolers) in 1 casing
- Max. operating pressure: 400 bar (5,800 psi)
- Pressure ratio: up to 30:1 (with natural gas mol. weight 20)
- Max. flow: 300,000 Am3/h (254 MMSCF/D)
- Simplified installation
- Higher reliability and availability due to less auxiliary equipment
- Lower downtime and easier maintenance
- Wide revamping flexibility



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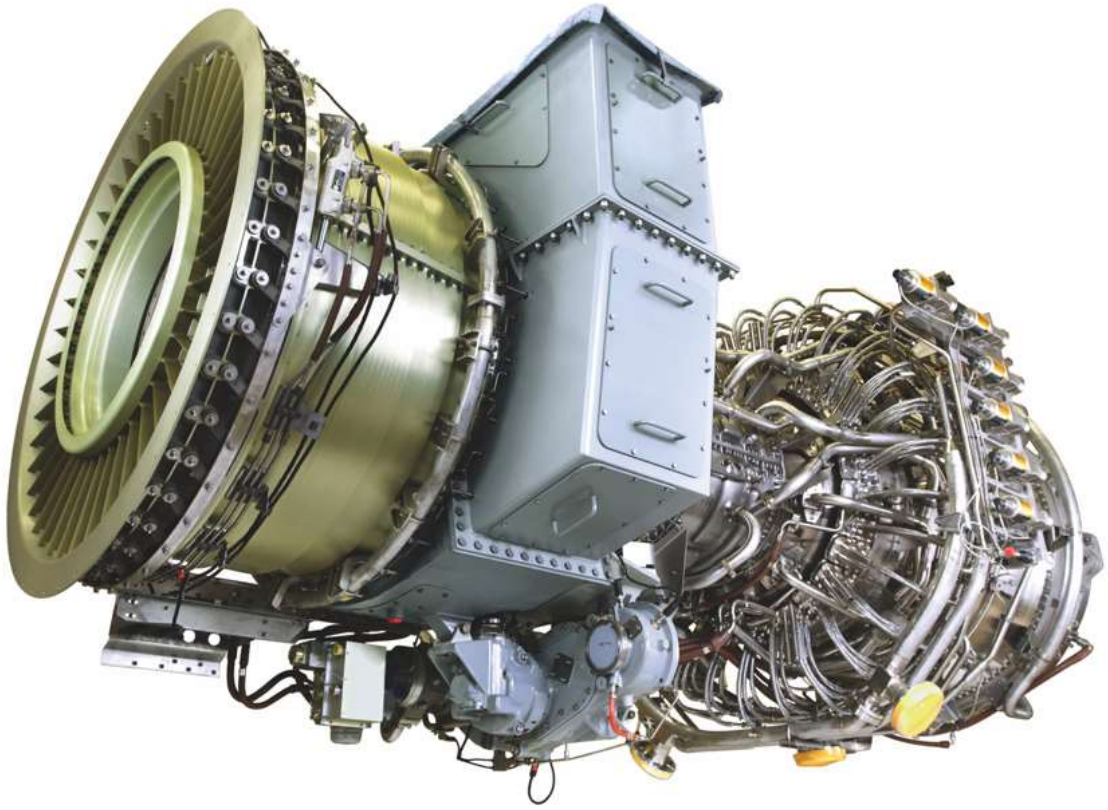
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LM6000-PF+: profit from best-in-class performance

Delivering cleaner, reliable, cost-effective power generation

- 54.3MW ISO rating 42.7% simple cycle efficiency
- Excellent reliability of 99.6% and availability of 98.4%
- Lightweight and modular design for optimized transport, installation, and maintenance
- Proven DLE combustion technology with over 30M hours of experience. Dual fuel capability
- Ideal for LNG: high thermal efficiency and starting torque
- Excellent fuel economy with lower emissions and fuel flexibility
- Providing 22% more power from an existing and proven platform



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LM2500+G5

Injecting technology to build on the LM2500 family legacy

Power

ISO: 38 MW @ 41% efficiency

Emissions

Improving on DLE 1.5 Technology to deliver 25ppm at full power or 15ppm if derated to G4 power

Availability

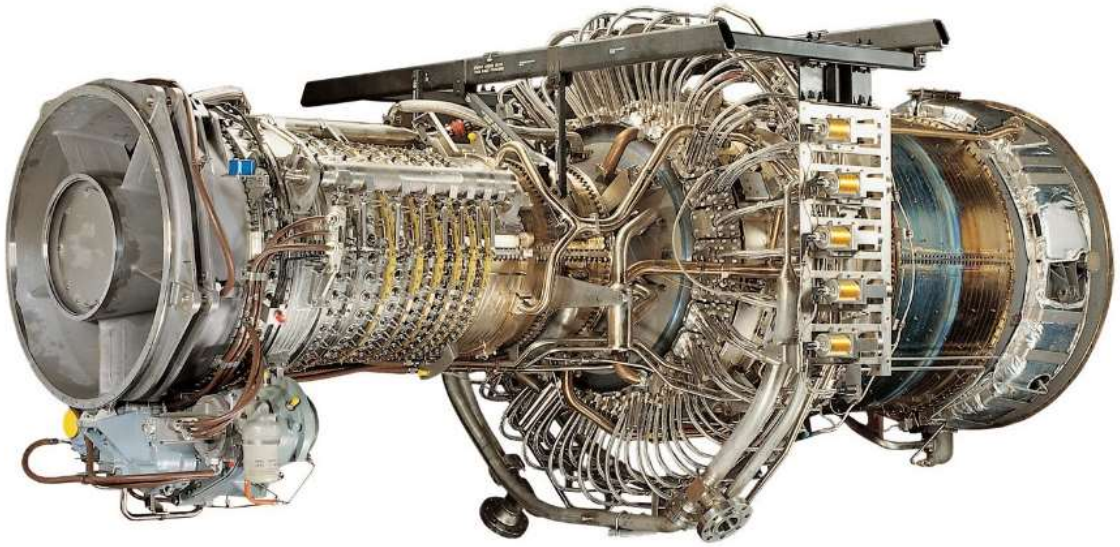
Technology injection and extensive test plan to deliver 25k/50k maintenance intervals at full power or 36k/72k if derated to G4 power

Durability

Injecting extensive durability improvements, backed by the most extensive testing and validation program ever performed on the LM2500 family

Upgradability

Direct replacement for Gas Generator (same flange-to-flange dimensions) with modifications to Power Turbines



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LM9000: proven in the sky, a breakthrough for LNG

Highest availability (>99%) and best-in-class total cost of ownership

Evolved from the GE90-115B, Boeing's 777 engine for over 14 years with 50 million flight hours and 99.98% departure reliability

ISO performance

- 65 MW power output
- 43% SC efficiency

Emissions

- 15 ppm NOx (gas)
- 25 ppm CO (gas)

Maintenance intervals

- Hot section: 36,000 hrs
- Overhaul: 72,000 hrs

Free power turbine

- Nominal 100% speed: 3,429 rpm
- Speed range 70 to 105%

Combustion system

- DLE 1.5
- 30-54 MWI gas fuel



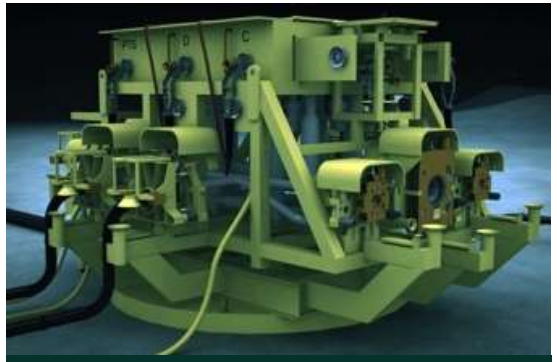
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Digital Solutions (DS)

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Digital Solutions markets served



Oil and gas

- Condition monitoring
- Control solutions
- Inspection technologies
- Measurement & sensing
- Process & pipeline solutions



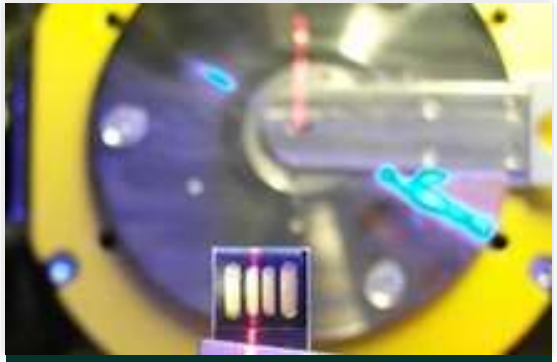
Power generation

- Condition monitoring
- Control solutions
- Inspection technologies
- Measurement & sensing



Aerospace

- Condition monitoring
- Control solutions
- Inspection technologies
- Measurement & sensing



Automation, electronics & other industrials

- Condition monitoring
- Control solutions
- Inspection technologies
- Measurement & sensing

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Digital Solutions (DS)

A global leader intelligent, connected technologies to sense, monitor, control, and inspect.

- ~8,200 employees
- Operating globally with major facilities in the U.S., Germany, Ireland, U.K., Belgium, Norway, UAE, China, Korea, Singapore and more
- Five product companies, comprised of 19 product lines
- 12+ manufacturing facilities, 40+ global facilities
- Headquarters: London, U.K.



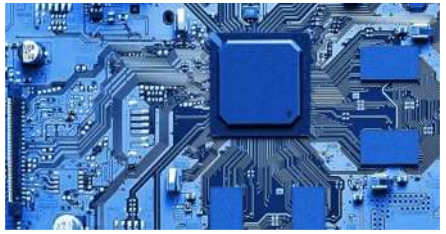
Bently Nevada condition monitoring and protection



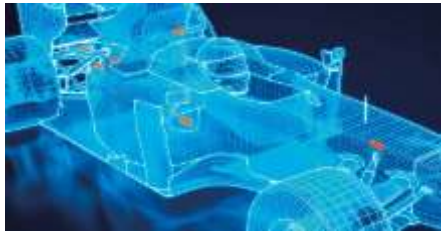
Control solutions



Process & pipeline services



Inspection technologies



Measurement & sensing

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Digital Solutions product & service portfolio

A horizontal solutions provider

40% Oil and gas

30% Power

22% Automation, electronics, and other industrials

8% Aerospace



Bently Nevada condition monitoring and protection

- Condition monitoring and protection devices
- Advanced machinery diagnostic software solutions
- Technical services



Control Solutions

- Control systems
- Industrial Cybersecurity
- Technical services



Inspection technologies

- Ultrasonic
- Film
- Radiography: X-Ray and CT
- Remote visual inspection
- Industrial inspection software



Measurement and sensing

- Pressure (Druck)
- Flow, Gas, Moisture (Panametrics)
- Nuclear instrumentation and radiation measurement (Reuter-Stokes)



Process and pipeline services

- Inspection (ILI)
- Pre-commissioning and maintenance
- Defect data analysis
- Integrity engineering

5 product companies, 19 product lines

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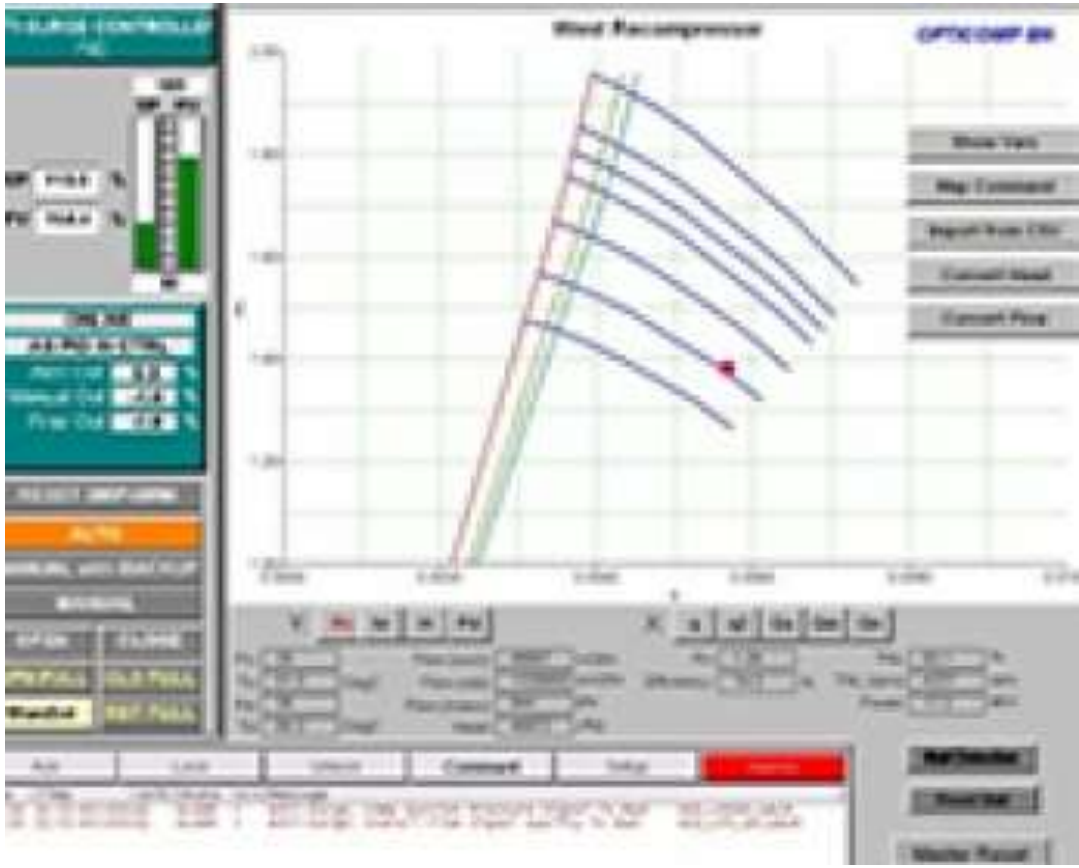
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OptiComp compressor control suite

Match compressor performance to process demand—safely and effectively

OptiComp™ provides advanced compressor control for improved anti-surge protection and performance efficiency. It's a proven solution with over 600 installations across the global oil and gas industry.

- Comprehensive and scalable solution, with superior control software running on our fast and reliable Mark™ VIe platform:
- Integrated turbine-compressor control
- Surge control
- Load sharing/performance control
- Enables control and protective functions to be extended beyond the core machine/train, to associated auxiliaries up to and including the entire station/plant



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Ranger Pro

A reliable, wireless solution to complement reliability/maintenance strategies

This low-cost entry into condition monitoring is a reliable, online solution to complement reliability/maintenance strategies.

- Truly wireless
- Provides 24/7 coverage of monitored assets—for rotating assets with medium and low criticality. Captures velocity, acceleration, temperature
- Waveforms, full S1, add protocol(s), Predix™ edge deviceISA100 protocol
- ATEX Zone 0
- D-cell battery
- Modular



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Sentinel LCT8 ultrasonic flowmeter

Delivering pipeline peace of mind

With four additional ultrasonic paths, the Sentinel LCT8 flowmeter performs in the harshest pipeline conditions, delivering reliable performance in leak detection, custody transfer + allocation measurement applications. LCT8 spells peace of mind in pipeline asset protection, performance, and profitability.



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Speed|scan CT 64

Automated high-speed CT for 3D mass production process control

- Typically scans up to several hundred times faster than conventional fan-beam CT
- Up to 100% dimensional control, defect analysis, and classification of large castings up to 500x900 mm
- Productivity and quality gains due to 3D automatic defect recognition (ADR)
- New: optional fully automated loading and unloading for inlineCT



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Process & Pipeline Services

- Integrated solutions
- Greater job continuity
- One crew = multiple services
- Improved schedules & cost efficiencies



Subsea pumping module connected to customer ROV



Gas transfer equipment on location



VECTRA tool ready to launch



Flaring activity for process plant



N2 pump

Key services

Pipeline services

Pre-commissioning

- Engineering
- Flooding, cleaning and gauging
- Testing
- Conditioning
- Subsea services
- Umbilical services
- Commissioning—product first fill
- Site preparations

Maintenance

- Mechanical cleaning
- Gel cleaning
- Chemical cleaning
- Testing and revalidation
- Nitrogen services
- Gas transfer/recompression
- Temporary flaring
- Temporary isolations
- Temporary pumping
- Pig manufacture

Pipeline inspection (ILI)

- Internal geometry inspection
- Mapping
- Corrosion and crack detection
- Ultrasonic pipeline inspection

Process services

Pre-commissioning

- Strength testing
- Leak detection
- Chemical cleaning
- Flushing/jetting
- Air blowing
- Drying
- Controlled bolting
- On-site machining
- Camera inspection
- Temp fuel gas supply

Maintenance

- Nitrogen services
- Leak detection
- Decontamination
- Tank cleaning
- Chemical cleaning
- Temporary flaring
- Gas compression and transfer
- Controlled bolting
- On-site machining
- Camera inspection
- Gas recompression
- Foam interting
- Preservation
- Oil flushing

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Process & Pipeline Services

Our portfolio of services helps you confidently manage the lifecycle of your asset: delivering timely and stress free start up, supporting day to day reliability and controlled decommissioning.

The mutual goal—safe operations, asset integrity and enhanced profitability.

Delivering a unique portfolio of:

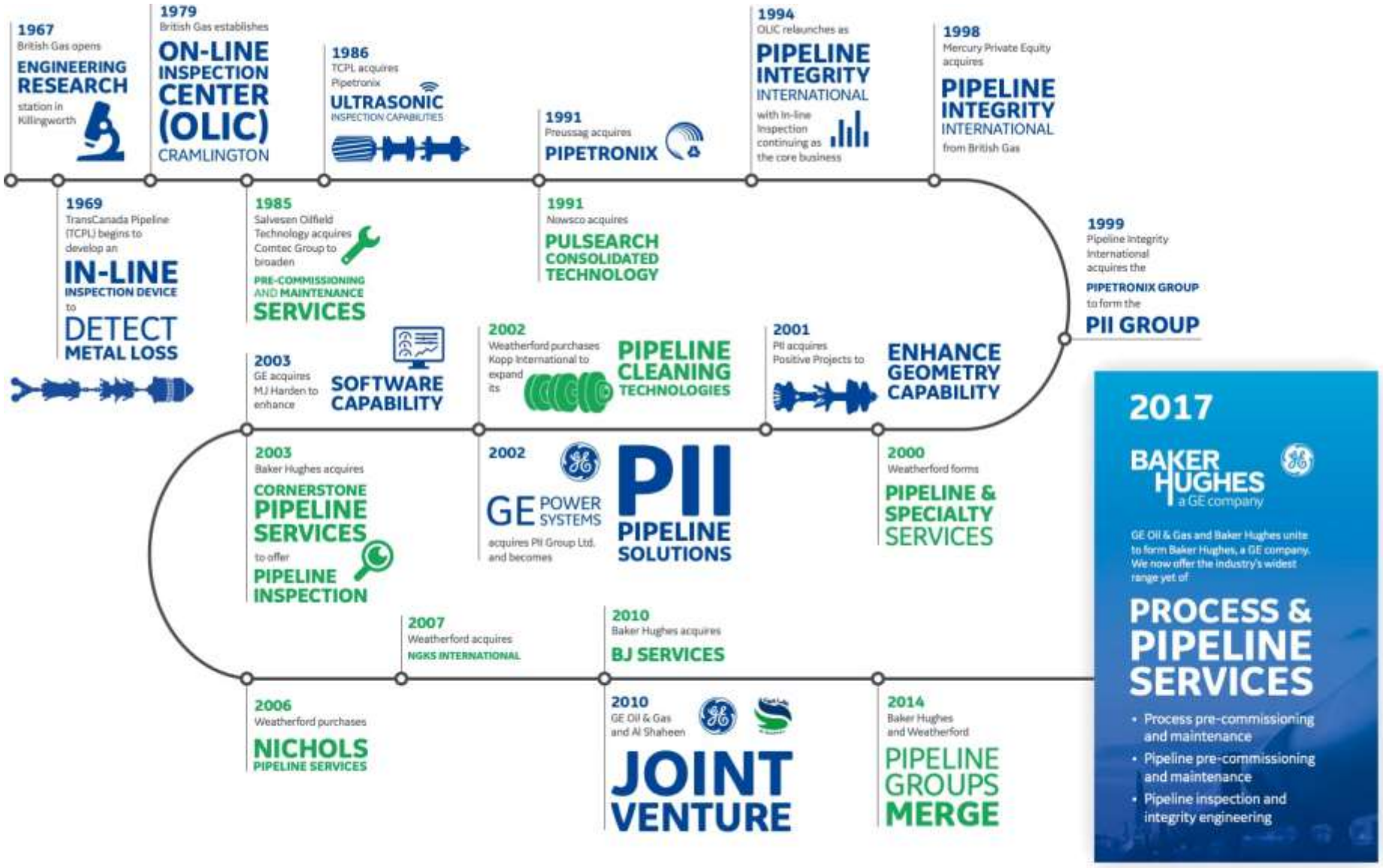
- Pipeline and process pre-commissioning and maintenance services
- Inline inspection and integrity services



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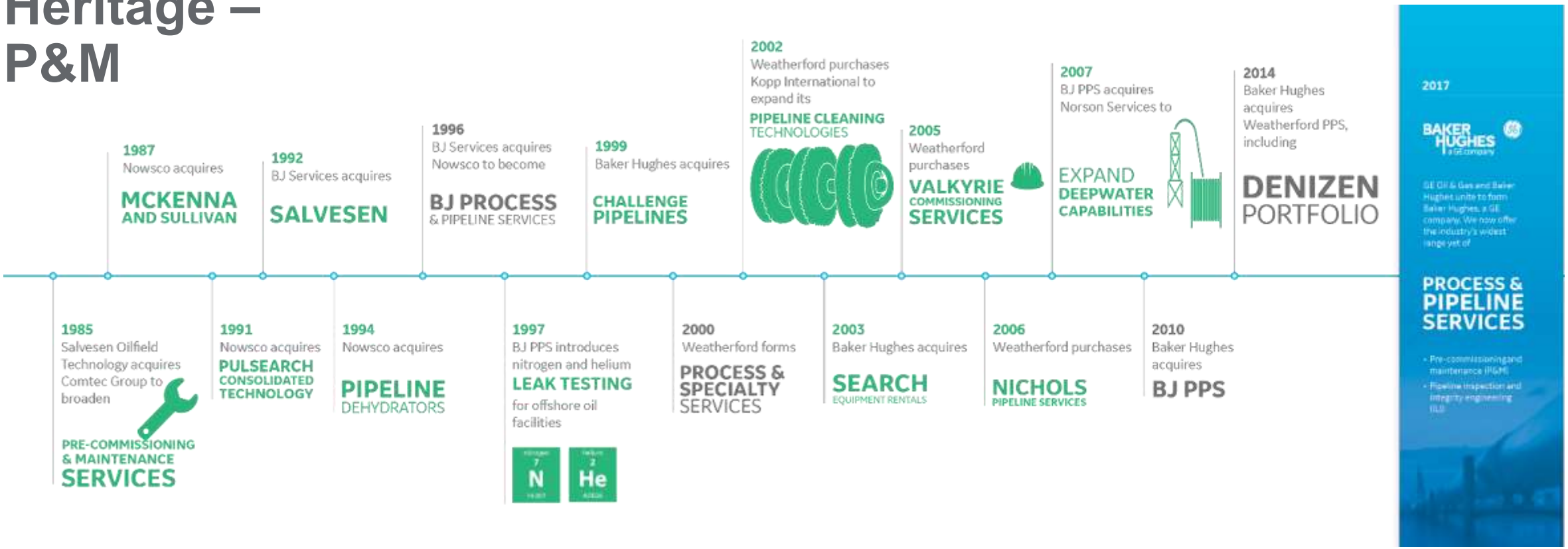
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Process & Pipeline Services Heritage - ILI



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Process & Pipeline Services Heritage – P&M



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Corrosion and metal loss

VECTRA™ GEMINI HD

- 20″ to 48″. MFL, Caliper & IMU technology
- Tri-axial sensors, 1.5D, speed control NPS24+



MagneScan™ **SHRP**

- 6″ to 52″. MFL, Caliper & IMU technology
- Tri-axial sensors, 1.5D, heavy wall
- SHR & HR resolution configurable



UltraScan™ **WM**

- 6″ to 42″. Ultrasonic wall measurement technology
- Pinhole specification with WMP



Detect smallest features with the highest accuracy and only repair what you need to

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Corrosion and metal loss

TranScan™ **TFI**

- 8 to 30″. High resolution axial MFL and Caliper
- Detect axial flaws with confidence



MagneScan™ **HR**

- 6 to 56″ High resolution axial MFL, Inertial, Caliper
- Dual diameter and heavy wall options



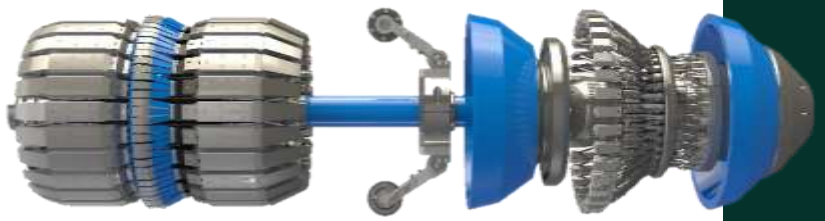
VECTRA™

- 12″ to 48″. MFL & IMU Technology
- Tri-axial sensors, 1.5D, heavy wall, speed control 24″ +



CPIG™

- 4″ to 48″. High resolution axial MFL, Caliper, IMU Technology
- Dual diameter and difficult to pig pipe pipelines



Select the right tool for all challenges

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Crack detection

UltraScan™ **CD/ CDP/ CD Edge**

- 10″ – 34″. Ultrasonic technology
- High speed capabilities, industry leading accuracy
- EDGE gives superior small crack detection (15mm)



UltraScan™ **DUO**

- 24″ to 36″. Phased array technology
- CD and WM capabilities.
- The highest performance ILI technology for advanced crack defect morphologies - replaces



EmatScan™

- 24″, 26″, 30″, 34″, 36″. EMAT technology
- Unrivalled POD of critical crack features
- Unrivalled POI performance means less digs
- Deployment in gas lines & liquid lines.
- Cracks in dents



Find critical crack-like defects with industry leading confidence

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Geohazard and third party damage

GEOPIG™

- 8″ to 48″. Caliper & IMU technology
- High resolution caliper, 1.5 D
- Dent Strain



CalScan **EP™**

- 10″ to 48″. Caliper & IMU Technology
- Line proving
- Dent strain



PROFILE™

- 12″ to 48″. Caliper technology
- Line proving for MFL/UT, robust, 1.5 D – 3 D, construction surveys



Precisely monitor pipeline movement and geometric anomalies

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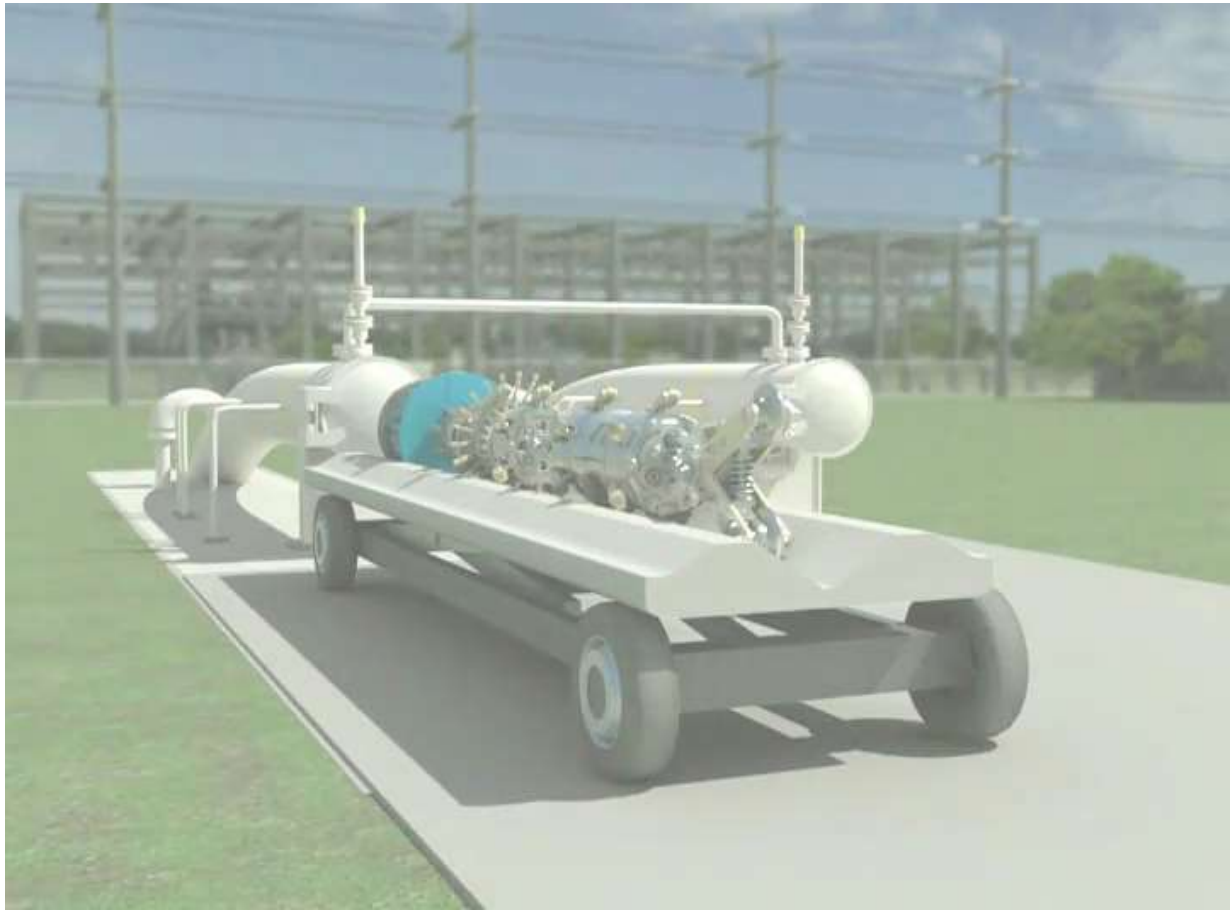
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Maximum data accuracy for peace of mind

Get a sharper view, more accurate data, and increase your confidence in your pipeline integrity with MagneScan™ SHRP, VECTRA™ HD and VECTRA™ HD Gemini

- > 90% confidence interval specifications
- Detecting and accurately sizing pin-holes and axial slots (channelling)
- Pit in pit identification & sizing
- Complex corrosion
- Integrated threat reporting options
- Girth Weld and Spiral Weld Assessment (GWA/SWA): detection, classification and sizing of GW/SW anomalies

Save money where it has the most impact— reducing unnecessary digs with reliable data



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Getting to the bottom of pits and pinholes

UltraScan™ WMP super-high-resolution ILI tool delivers significantly higher axial, radial and circumferential resolutions to improve both the detection and sizing of pitting and pinhole corrosion.

It allows for higher confidence in developing immediate and short-term repair schedules, while long-term remediation activities and re-inspection intervals can be substantially improved.



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CPIG™ for low pressure, difficult to pig and dual diameter pipelines

Combination technology:

- Acquires metal loss, caliper and inertial data in one run
- Enhances consistent and correct anomaly classification
- Navigates multiple 1.5D back-to-back bends and bore reductions up to 25%
- Runs effectively in some pipelines previously considered unpiggable
- Eliminates most pipeline, launcher, or receiver modifications

Your solution for challenging and unpiggable pipelines



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TranScan™ TFI

The innovative TranScan™ inspection tool detects long, narrow defects that run parallel to the axis of the pipeline. This ensures that axial flaws (cracks and elongated metal loss) present their largest dimension to the magnetic flow, creating a strong signal from flaws that have previously been invisible to magnetic tools.

- Pre-1970 ERW seam welds – hook and lack-of-fusion cracks
- Seam weld defects
- Narrow axial corrosion
- Preferential seam weld corrosion
- Axial laps

A key technology for pipeline verification and validation



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Driving enhanced pipeline safety with UltraScan™ CD EDGE

- Latest generation crack detection tool
- Innovative design, 70% + sensors delivers significant improvement in crack detection
- ‘Sees’ defects as small as 15mm/0.6 in. (less than diameter 1 cent Euro)
- Drive confidence in pipeline integrity decision making



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Raising the bar for crack detection with EmatScan™ CD

Targeted use for in gas pipelines, our EmatScan™ CD is ideally suited to detect a full range of crack-like features including;

- SCC colonies
- Sub-critical SCC
- Longitudinal fatigue cracks
- Toe and hook cracks
- Lack-of-fusion cracks
- Cracks in or adjacent to long seam weld



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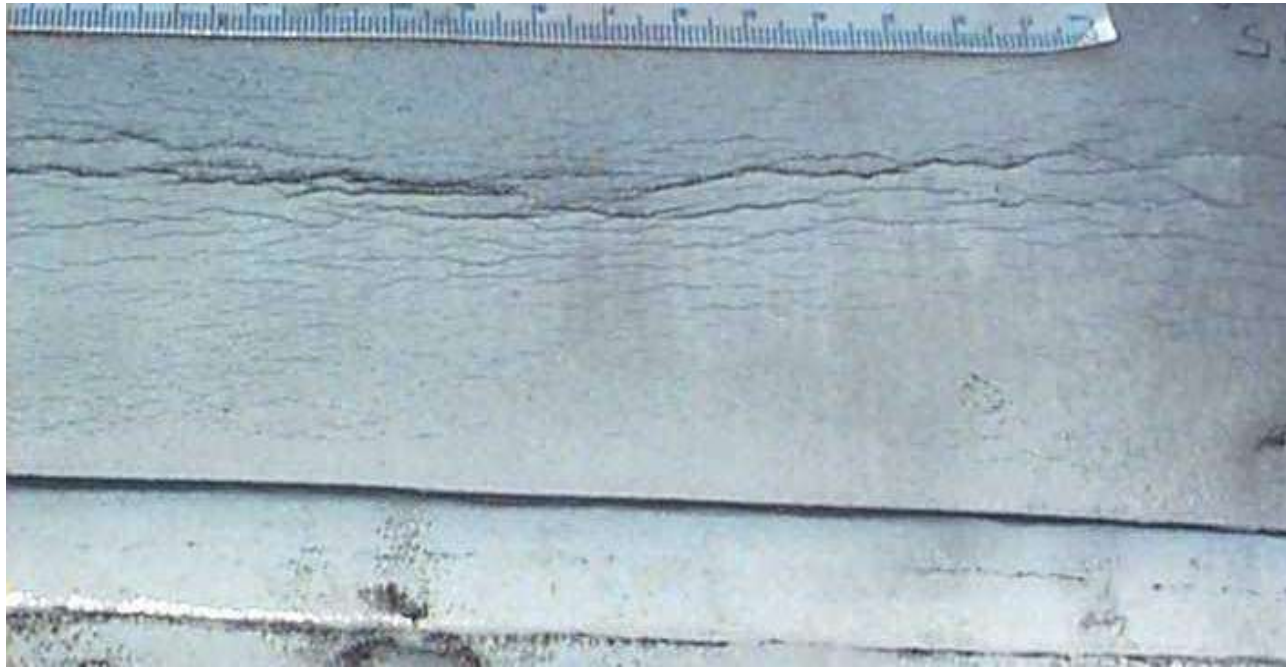
Managing crack related threats in a pipeline with PICA

Cracking is the most severe type of defect in a pipeline. Crack growth rates can be fast and failure often results in a rupture event.

Our PICA (Post Inspection Crack Assessment) solution applies industry best practice crack assessment methodologies to assess reported features and provides a rigorous and fully documented ECA (Engineering Critical Assessment). Our five products include:

- Crack Profiling
- Crack Assessment
- Lamination Assessment
- Crack Comparison
- Crack Susceptibility

Long term proactive integrity management avoiding costly & unnecessary repairs



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Manage geohazards with GEOPIG™

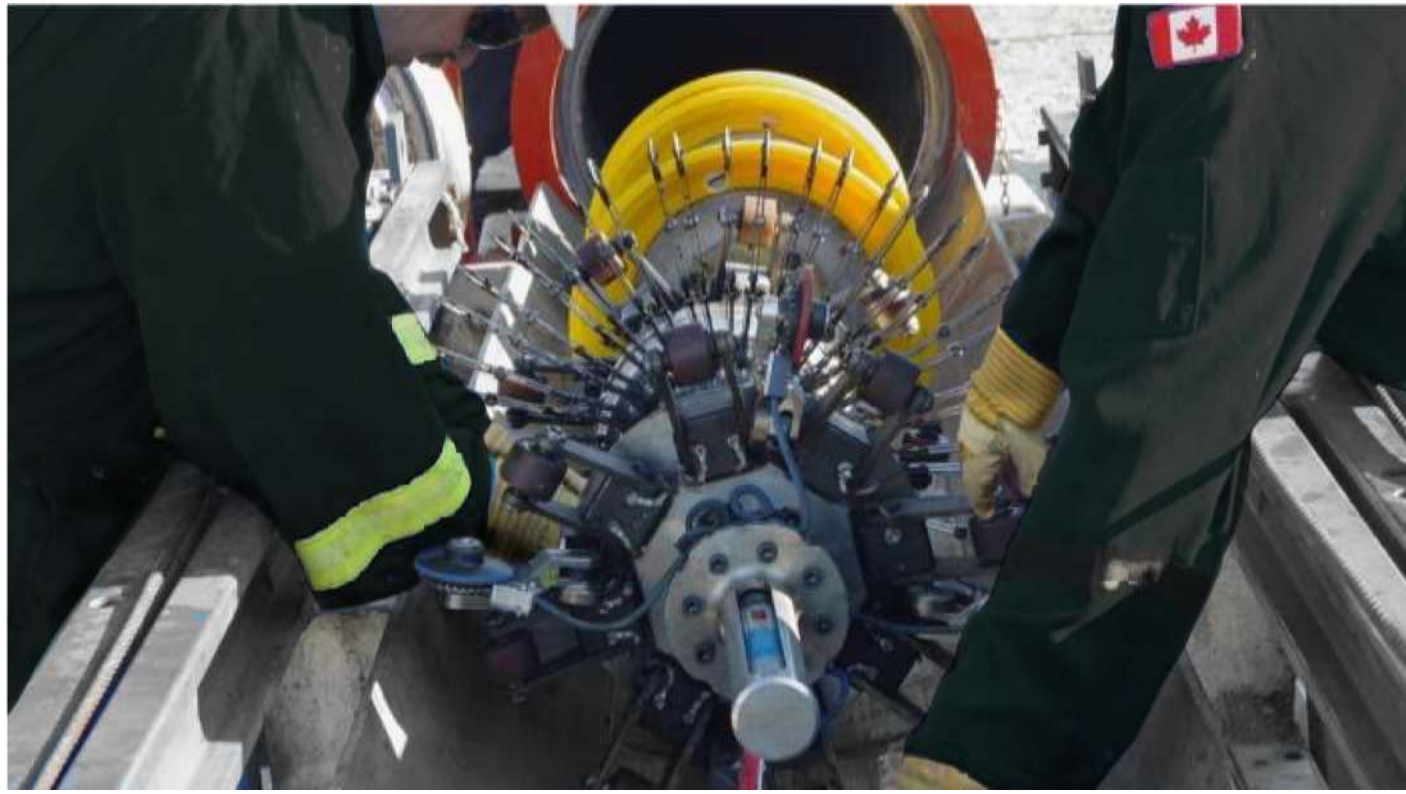
Slope instability, frost heave, subsidence, flooding, upheaval, or construction practices can result in residual and induced bending strain

GEOPIG precisely measures the changes in bending strain resulting from pipeline movement and pipeline centerline location.

High resolution caliper accurately measures and identifies any associated dents, wrinkles, buckles, ovality or other geometric anomalies.

Offshore out-of-straightness surveys

Depth of cover determination



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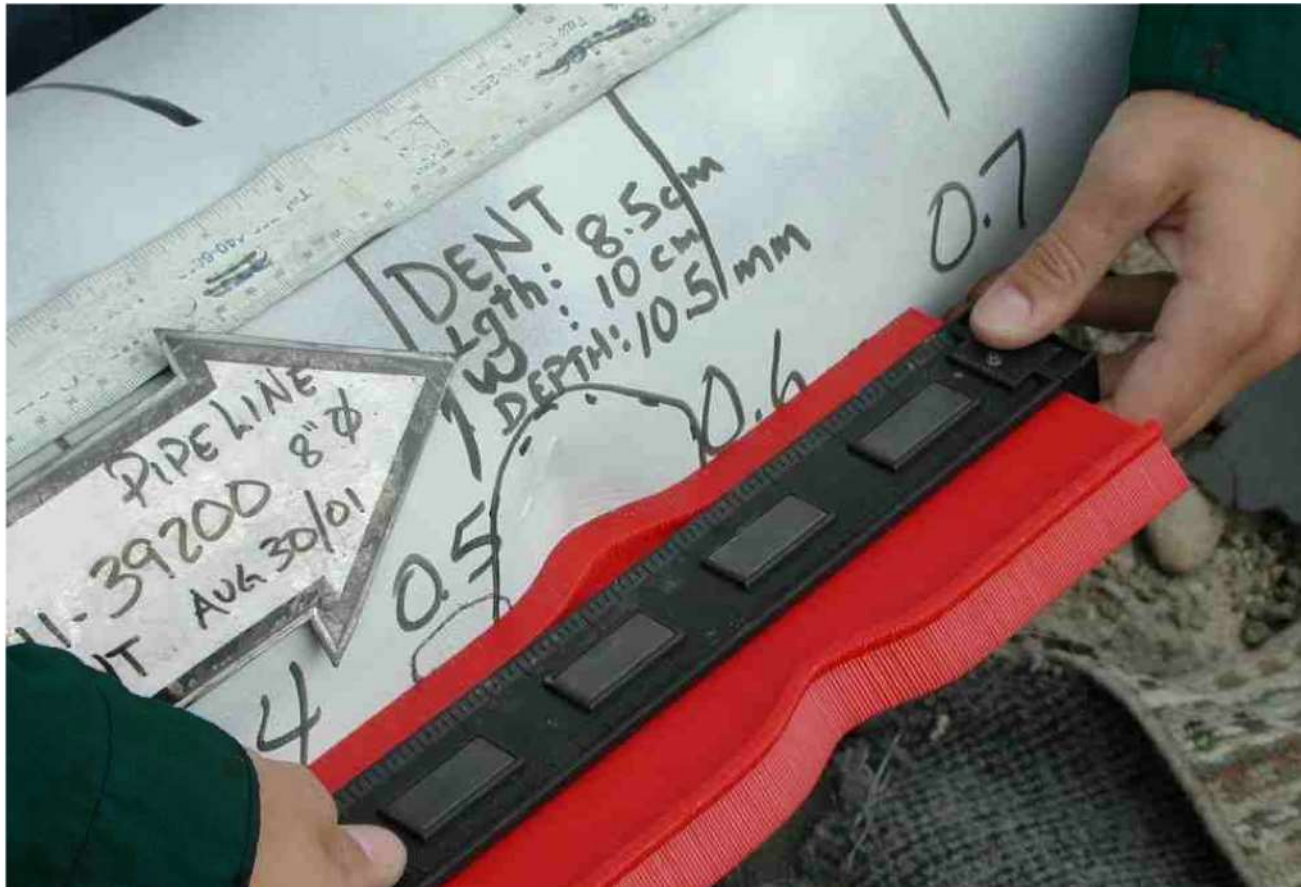
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Evaluating mechanical damage with PIDA

In a non-fatigue environment, strain is the best indicator of severity and imminent failure of dents.

Our PIDA (Post Inspection Dent Assessment) study provides the following benefits;

- Effective and realistic assessment of the fatigue risk from dents located on a pipeline
- Minimize current and future risk of dent failure for latent dents
- Avoid costly and unnecessary evacuations and repairs whilst maintaining safety



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Economically identify and measure critical strain-related pipeline threats

Until recently, axial strain could be measured only in areas thought to be high-risk, or through monitoring program in areas already subject to damage, leaving the risk-level of large portions of pipeline essentially unverified.

Now there is a better option. The innovative AXISS™ axial strain measurement is the first technology capable of providing a continuous measurement of axial strain variations along a pipeline's length:

- Combines with our MFL inspection technologies for a comprehensive total-strain analysis of large areas of at-risk pipeline
- Measures small changes in strain conditions over the lifetime of the pipeline and decreases the need for costly, continuous monitoring using strain gauges or other techniques

The only choice for a comprehensive total-strain analysis inspection



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Corrosion growth comparison

Corrosion growth is complex, highly variable and location specific.

RunCom™ compares individual defects at the signal level on repeat runs to quantify location specific rates.

- Enables optimization of repair and re-inspection planning on economic and safety basis
- Proactively prevent leaks and failures
- Reduce costs—best in class matching accuracy and repeatability minimises conservatism



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Adding value to ILI reporting through Fitness for purpose

Find peace of mind

The cost effective and safe strategy based on ILI findings

The Fitness for Purpose (FFP) assessment provides proactive rather than reactive corrosion management, telling the operator the what, where, when and why?

This long term integrity management strategy, optimizes repair and reinspection planning safely with enhanced profitability in mind.



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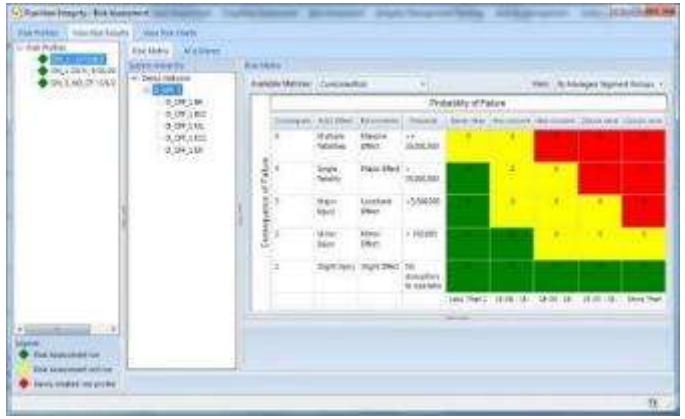
Tipping the scale from risk to reward

At the heart of a risk-based pipeline integrity management system (PIMS) is PipeView™ Integrity (PVi)—a suite of proven software tools designed specifically to manage, evaluate, and cohesively report on all the different data collected for pipelines.

It allows the organisation to quantify risk and improve decision-making by all business functions and can reduce annual inspection costs by 31%*.







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Reducing plant turnaround cost with SMART CLEAN*

SMART CLEAN decontamination services deliver performance with unyielding attention to safety and environmental compliance.

- Proven chemical cleaning products and environmentally sound cleaning
- Reduce need to process, store, or remove hazardous waste
- Safe, on-time vessel entry so that turnaround schedules are met or shortened.
- Increase hydrocarbon recovery for reprocessing without adversely affecting operations
- High performance industrial cleaning chemistry, targeting-specific cleaning needs
- After application, workers can then quickly and safely enter these vessels and tanks for inspection and repair.

Fast, effective equipment cleaning



**Applications include offshore production facilities (platforms, FPSOs) and Hydrocarbon processing facilities (petrochemical plants, refineries, LNG plants)*

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SMART CLEAN* decontamination services

Safe vessel entry

- Minimal exposure of people to hazards
- Environmental impact
- Proper handling and disposal of waste
- Reduced environmental risk
- Reduced total cost of operation
- On-time unit handover

Benefits of using PPS

- The only decontamination process to eliminate pyrophoric risk
- Industry advocated high-performance industrial cleaning chemistry
- Minimizes post-cleaning hazardous waste volumes
- Mobilized and trained competent workforce



**Applications include offshore production facilities (platforms, FPSOs) and Hydrocarbon processing facilities (petrochemical plants, refineries, LNG plants)*

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Pipeline pre-commissioning*

Engineering, flooding, cleaning and gauging, testing, conditioning, subsea services, umbilical services & commissioning—product first fill.



Deepwater projects

- Widely recognized subsea technology with the Denizen™ product range including a bespoke coiled tubing downline system
- Experience in all deep water arenas around the world, e.g. Liwan, Lula, OCTP, West Hub, TEN, Kizomba, Ichthys, Hadrian south, Jack St Malo
- Continuous development of subsea technologies
- Umbilical services



Pre-commissioning of major projects

- Global footprint
- World's largest equipment fleet
- PPS can offer turnkey services, such as inclusion of site preparation and vessel supply into scope of work
- Experience on the world's most significant projects, e.g. Nord Stream, South Stream, Ichthys, Gorgon Janz, Wheatstone, Sur de Texas Tuxpan, Shah Deniz, Medgaz
- In-house chemicals, pigs and caliper solutions

* Subsea pipelines, land-based pipelines, subsea umbilical's, risers and flowline (SURF) systems

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Umbilical services

We provide complete turnkey services for pre-commissioning and commissioning umbilical systems from load-out at the manufacturing facility to installation.

- Hydraulic monitoring during transit
- Hydraulic monitoring during lay
- Flushing, pressure testing with system fluid
- Continuity Resistance (CR)
- Insulation Resistance (IR)
- Time Domain Reflectometry (TDR)
- Optical Time Domain Reflectometry (OTDR)

Our objective expertise and unmatched experience ensure cleanliness and integrity whilst verifying lines conform to predefined specifications.





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Pipeline maintenance

Mechanical cleaning, gel cleaning, chemical cleaning, testing and revalidation, nitrogen services, gas transfer/recompression, temporary flaring, temporary isolations, temporary pumping and pig manufacture.



Cleaning

- Tailored cleaning solutions to keep pipelines at optimum operating conditions
- Mechanical and chemical cleaning
- GelPig™ cleaning offers significant debris recovery including 'black powder' recovery, wax and other deposits
- General maintenance/routine cleaning
- Cleaning in readiness for 'ILI' campaign as 'turnkey' offering



Isolations

- Localized repairs within pipelines enabled
- Isogel valve sealant
- High differential pressure pig trains. Pipe freezing is a method of temporarily isolating a pipe by applying a freeze jacket and circulating a cooling agent (liquid nitrogen). The contents within the pipe are chilled to create a solid, frozen plug with pressure holding capabilities
- Used in valve change outs and pipeline revalidation



Environmental services

- Safe handling of hazardous gases that a customer would otherwise lose to atmosphere
- Temporary flaring services—trailer mounted or modular
- Gas recompression and transfer
- 2 or 3 phase separation
- High pressure pipework and monitoring equipment



Temporary pumping

- Liquid transfer
- Often used to support enhanced oil recovery by the provision of temporary water injection services

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Gas transfer

PPS has the ability to transfer natural gas from one system or pipeline to another at discharge pressure of up to 100 barg and to a residual pressure approaching 0 barg (gravity).

Our market leading gas compressors have greatly enhanced the effectiveness of the service, increasing the recovery volumes and reducing transfer time.

Our gas transfer service utilizes two types of equipment:

- High Pressure (HP) compressor: 7 to 100 barg
- Low Pressure (LP) compressor: 0 to 28 barg
- High Pressure (HP) + Low Pressure (LP): 0 to 100 barg







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Inline inspection and integrity services

The right technology for every technology challenge



Corrosion and metal loss

- General, complex corrosion
- Pitting, pinholes or laminations
- Dents with metal loss
- Clean baselines, few defects
- Lost integrity
- Direct comparisons of corrosion growth between inspections



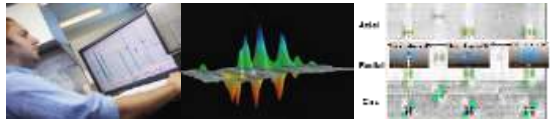
Crack detection

- Pipeline with propensity for seam and girth weld cracks
- SCC cracks of unknown gestation and failure state
- Extensive SCC crack fields populated with both critical and subcritical cracks



Geohazard & third party damage

- Internal diam. (ID), reductions, expansions
- Bends, ovalities buckles, gouges
- Construction, third-party damage and product theft
- Dents with cracks, gouges, or corrosion
- Inaccurate location of pipeline fractures
- Missing records
- Excessive tensile strain which can lead to line rupture
- Large compressive strain which may cause buckling or wrinkles



Crack detection

- Complete pipeline integrity solutions from a single source.
- Reduce risk, minimize costs by avoiding unnecessary repairs, and achieve regulatory compliance
- Defect assessment and validation
- Integrity software suite that delivers smart filing of ILI data

Enabling products

- MagneScan, VECTRA, VECTRA GEMINI
- UltraScan WM/WMP
- UltraScan DUO
- TranScan TFI
- CPIG
- Runcom, Fitness for service, Pipeline risk assessment

- EmatScan
- UltraScan CD, CDP
- UltraScan CD EDGE
- UltraScan Duo
- TranScan TFI
- Pipeline risk assessment, IMU strain, PICA

- PROFILE, CalScan EP
- GEOPIG
- MagneScan, VECTRA, VECTRA GEMINI
- ThreatScan
- Pipeline risk assessment, IMU strain, PICA, Fitness for service

- PVi (PipeView Integrity)
- PICA (Post Inspection Crack Assessment)
- PIDA (Post Inspection Dent Assessment)
- Fitness for service
- Runcom
- Pipeline risk assessment

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Pre-commissioning & commissioning services

- Integrated solutions
- Greater job continuity
- One crew = multiple services
- Improved schedules & cost efficiencies

Pipeline services

Pre-commissioning | Maintenance | Pipeline inspection (ILI)

Debris free start-up

- Flushing and jetting
- Air blowing
- Chemical cleaning
- Oil flushing
- Pigging
- Camera inspection
- Laboratory services

Plant conditioning

- Air drying
- Nitrogen drying
- Vacuum drying
- Accelerating cooling
- Accelerated heating
- Inerting

Process services

Pre-commissioning | Maintenance

Leak free start-up

- Valve testing
- PRV calibration
- Pressure testing
- Mechanical Joint Integrity (MJI)
- Leak testing

Temporary process solutions

- Compression
- LNG supply
- Turbine testing
- Pumping systems
- Cooling/heating
- Compressor testing
- Temporary flaring

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Pipeline pre-commissioning

Mechanical and chemical cleaning, pressure testing, leak testing, drying, nitrogen purging, gas transfer and flaring.



Nitrogen services

- Identifies leaks in excess of predetermined spec
- Industry's preferred method of checking joint integrity and preparing hydrocarbon process facilities for leak-free start up
- Frees the system of oxygen prior to start up



Hydrotesting

A strength test is always required for new piping and associated vessels to ensure the following

- Safety
- Reliability of operation
- Leak tightness of pressure systems

All work is conducted under rigid procedures and according to code, ensuring total control at all times.



Air services

- Variety of effective drying techniques for process systems that are sensitive to moisture
- Suitable for complex plant configurations with multiple vent points
- Equipment can be cross-utilized for air blowing, pneumatic strength testing and purging (w. membrane nitrogen)



Chemical cleaning

- Environmentally friendly non toxic and non hazardous cleansing fluids
- Non classified and carries CEFAS approval (Gold Band).
- Degreasing, descaling, passivation
- Cleaning of critical compressor/turbine associated pipework post assembly



Temporary flaring

- Regulate and ensure low emissions using the patented, hi-lo variable flare tip
- Self-erecting, trailer-mounted for small operations or as a modular system for a long-term cost-effective solution
- Clean and efficient burn of waste gases, even if gas flow rate continuously changes



Lube oil & hydraulic oil flushing

- A fluid circulation process designed to remove contaminants and decomposition from a lubrication-based system
- Improves lifecycle of rotating equipment and reduces
- Follows industry best practices and ISO cleanliness codes to minimize risk to people and equipment

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Pre-**commissioning of the world's** largest offshore gas pipeline

Large diameter gas transmission projects

The ground breaking Nord Stream pipeline project, comprised of two 1,224km long, 48-in. diameter twin gas transmission pipelines running from Russia to Germany– a delicate marine environment that needs to be protected and preserved.

The world's longest-ever single-section dewatering operation, including the longest travel distance for tie-in sealing tools. Establishing a concept, engineering and planning, selecting a main water source and water treatment regime, and identifying risks were among the tasks project managers undertook.



The entire process was helped by a specifically designed equipment spread

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Saving time and money with SAVAS and HP Smart Gauge Tool

Case study:
deepwater technologies







Scenario

Before you can perform a hydrostatic test on a new subsea pipeline, you must first confirm the pipe's internal bore. This requires a gauge plate mounted on a bi-directional (bi-di) pig to run through the pipeline and into the receive trap.

Traditional procedures require the operator to have time consuming deployments of a ROV, receiver head recovery and redeployment after gauge plate assessment as well as vessel movements between locations.

Key benefits

- HPSGT eliminates the need to recover test head and examine gauge plate before hydro test
- SAVAS eliminates the need for vessel relocation from launcher to receiver to close/open valves before/ after hydro test
- Used in combination, they can:
  - Save significant vessel time by eliminating two transit operations
  - Remove risks associated with PLR recovery
  - Reduce risk of weather delays
  - Significantly reduce the number of ROV deployments

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Process maintenance

Mechanical and chemical cleaning, pressure testing, leak testing, drying, nitrogen purging, gas transfer, flaring, controlled bolting, on-site machining, camera inspection, gas recompression, foam inerting, preservation, oil flushing and decontamination



Nitrogen services

- Prevent loss of production due to unplanned shutdowns
- Industry's preferred method of checking joint integrity & preparing hydrocarbon process facilities
- Can be engineered, planned and scheduled in advance to minimize impact on concurrent work



Drying services

- Variety of effective drying techniques for process systems that are sensitive to moisture
- Suitable for complex plant configurations; multiple vent points
- Equipment can be cross-utilized for air blowing, pneumatic strength testing and purging (w. membrane nitrogen)



Reactive chemical cleaning & decontamination

- Environmentally friendly non toxic and non hazardous cleansing fluids
- Non classified and carries CEFAS approval (Gold Band).
- Degreasing, descaling, passivation
- Cleaning of critical compressor/turbine associated pipework post assembly
- Decontamination and tank cleaning



Temporary flaring

- Regulate and ensure low emissions using the patented, hi-lo variable flare tip
- Self-erecting, trailer-mounted for small operations or as a modular system for a long-term cost-effective solution
- Clean and efficient burn of waste gases, even if gas flow rate continuously changes



Mechanical Joint Integrity (MJI)

Whether you're developing a Greenfield site, expanding a refinery, building process modules in a construction yard or hooking up an offshore platform our Mechanical Joint Integrity offering including our Electronic flange management system can be key driver to realizing a leak free start up.

Baker Hughes' mechanical joint integrity service is offered as a standalone offering or as a part of integrated services.

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Maintenance & shutdown services

- Integrated solutions
- Greater job continuity
- One crew = multiple services
- Improved schedules & cost efficiencies

Pipeline services

Pre-commissioning | Maintenance | Pipeline inspection (ILI)

Debris free start-up

- Flushing and jetting
- Air blowing
- Pigging
- Camera inspection
- Decontamination

Plant conditioning

- Air drying
- Nitrogen drying
- Vacuum drying
- Accelerating cooling
- Accelerated heating
- Inerting

Process services

Pre-commissioning | Maintenance

Leak free start-up

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- Mechanical Joint Integrity (MJI)
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Temporary process solutions

- Compression
- LNG supply
- Turbine testing
- Pumping systems
- Cooling/heating
- Compressor testing
- Temporary flaring

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Increased safety and reduced equipment costs with our tank cleaning services

Combined
Baker Hughes offering

Tank cleaning

Treatment options

- Batch treatment to rapidly reduce sludge in tanks and reduce tank turnaround costs
- Continuous treatment to slowly reduce sludge; reduce water, salt and solids to the CDU; allow processing of difficult opportunity crudes and reduce CDU operation costs
- Offline clean to clean up remaining sludge and allow vessel entry



Benefits

- Lower costs and reduced manpower
- Recovery of viable “re-run” feedstock, blendstock and marketable fuel

Minimized hazardous waste disposal & cost

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Increased safety, improved recoveries and reduced turnaround time with our tank cleaning services

PPS offering

Tank cleaning for inspection and maintenance

- Heat and horsepower only transfer the problem from one tank to the next
- Baker Hughes specialty chemicals applied during the initial mixing stabilize the hydrocarbons so they remain as a liquid recoverable hydrocarbon
  - Maximizes recoverable hydrocarbon yields
  - Allow wastewater to be processed through the refinery WWTP with no adverse effects
  - Solid inorganic waste is generally non hazardous waste
  - Provide shorter turnaround times when compared to standard mechanical methods
  - Reduced safety concerns as there is no manned entry until tanks are gas free



Minimized hazardous waste disposal & cost

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Mechanical joint integrity and in situ machining

- MJI supplied to client base through construction into commissioning
- Supply of hand, hydraulic torqueing and hydraulic bolt tensioning
- Equipment to cover ½"NB to 36"NB flanges and clamps in all class's
- Joint integrity management software package
- Technical support

On site machining includes:

- Flange facing ½" to 36"NB
- Pipe cutting ½" to 36"NB







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Mobile flaring services

Our innovative and cost effective service for safe flaring

Mobile flaring services

- Plant shutdown waste gas incineration
- Well testing H_2S incineration
- Gas flaring during well testing
- Incineration of H_2S or sulphur, CH_4, C_2 to C_6
- Degassing of tankers, storage tanks, or vessels
- Incineration of waste vapors or by-products
- Degassing of landfill sites

Main features

- Shrouded flame to minimize visual disruption/heat radiation (40-50ºC outside wall)
- Clean smokeless burn using "variable flare tip" system
- Low noise thanks to the enclosed flame (72dB @ 3 – 5 mt)
- Over 1,000ºC sustainable for waste gas incineration
- Automated variable air ducts incorporated into stack

Specification

- Stack capacity: 20.1 MW
- Auxiliary fuel injection for low calorific value waste gases
- Two independent suction pump to pull waste gases out of a system
- Air pre-mix
- Fail-safe PLC controlled
- Continuous emission monitoring

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Nitrogen services

Baker Hughes' nitrogen services reduce project time, risk and cost with efficient nitrogen usage onshore or offshore during new construction or turnarounds.

- Purging and blanketing
- Leak testing
- Accelerated cooldowns
- Drying

We ensure you have a clean, dry, leak-free, and inert unit ready to safely receive product the first time, according to industry standards. If temperature is an issue, we can precool or preheat your piping and vessels to the required level.



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Digital enablement

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Value creation through real digital solutions

Field planning & optimization

Optimizing access to the most hydrocarbons in place by integrating reservoir intelligence with:

- Well planning
- Drilling information
- Geomechanical modeling

Production optimization

Optimizing primary recovery

Secondary recovery optimization

Maximize recovery

Process + Equipment Management (APM)

Optimizing primary recovery

Secondary recovery optimization

Fit-for-Purpose solutions

Tailor made solutions for customer-specific use cases. Delivered with speed, efficiency, scalability, and flexibility

Unique application of reusable micro-services, foundational data services, analytics, and domain expertise

Platform enablement | Digital foundation | AI factory

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Digital transformation

We extract the power of data to improve operational productivity, efficiency, and safety.



BakerHughesC3.ai

Artificial intelligence and machine learning

Innovation at the industrial edge

Measurement & Controls technologies

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C3 joint value propositions

Baker Hughes

- Deep domain expertise
- Provide critical feedback to product development roadmap based on direct customer feedback
- Deliver value added services on top of software license sales
- Opportunity to leverage BHGE product companies
- Provide commercial flexibility often required from Oil & Gas customers
- Global sales and marketing teams to amplify market awareness and positioning
- Access to senior decision makers at major customers

Global reach and established footprint

Access to senior leaders at the leading IOCs / NOCs

Combined expertise in data analytics & AI



Highly trained team of data scientists

Jointly demonstrated ability to solve complex problems

Unique technology platform

C3

- Credibility and confidence with technology platform
- Provide customers with rich analytical insights on hardened, stable, scalable AI technology platform
- Configure, deploy, operate, and deliver continuous innovation to C3 platform and applications
- Provide FDEs (Forward Deployed Engineers) to quickly translate business challenges into working solutions
- Recruit and retain technology talent that allows for sustained innovation of software platform

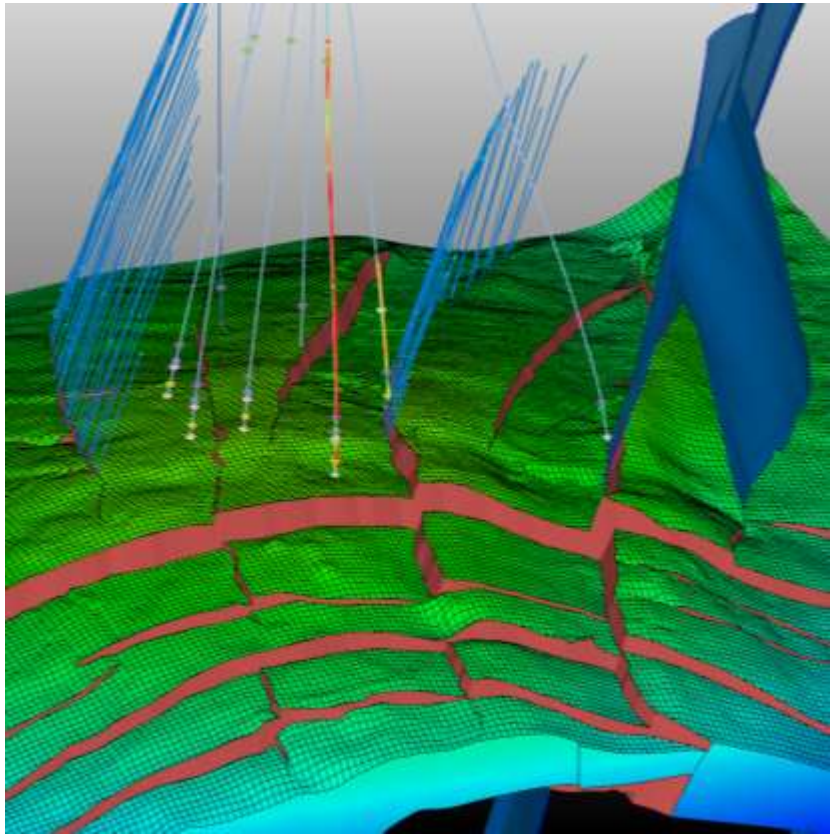
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Case study—JewelSuite

Shell—adding Value to Upstream business

- Rapid iterations enabled by workflow-driven approach and rapid grid updates
  - Building a model from scratch can be done in 2 days with JewelSuite rather than 2 weeks using other modeling software
  - Updating an existing model takes just 1 – 2 minutes, even for a very large full-field model
- Improved predictive power through support for multi-concept uncertainty workflows
- Proven to be more predictive in greenfield and brownfield settings
- Improved integration within teams through a common data model and shared reservoir and fluid description



Identifying hydrocarbon amounts in a particular underground location	Determining recovery strategies to implement and optimize	Predicting reservoir recovery factors over time

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Flexible partnerships & commercial models

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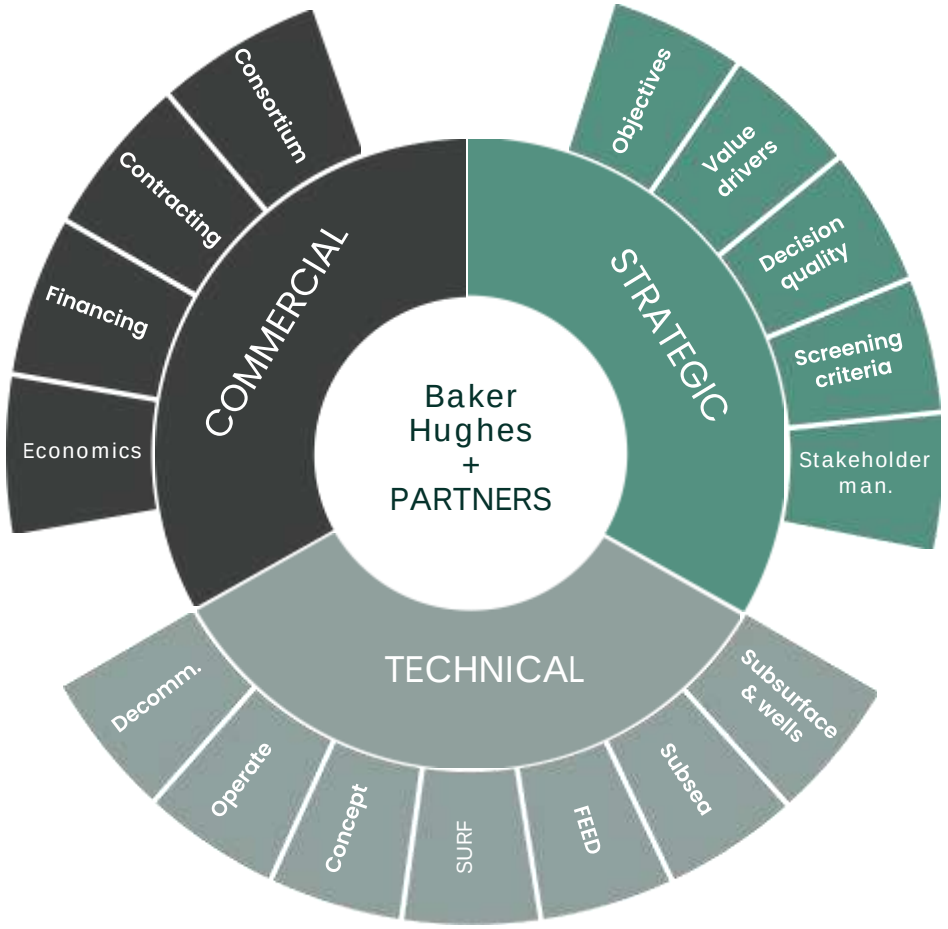
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Flexible partnerships and commercial models

Baker Hughes's partnership model mean we can tap the right established partners to meet our customer needs and project economics.

- Portfolio evaluation
- Exploration and planning support
- Concept—FEED
- SPS-SURF
- Pipelay and construction vessels

From assessment and project design to SPS-SURF solutions, our partnerships offer a comprehensive solution that reduces complexity, offers integrated solutions and accelerates speed to market—across subsurface, wells, and subsea for global customer projects spanning the fullstream.



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Case Study (Subsea Connect)

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Subsea Connect

Executive Summary

January 28, 2020

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Trends in Subsea

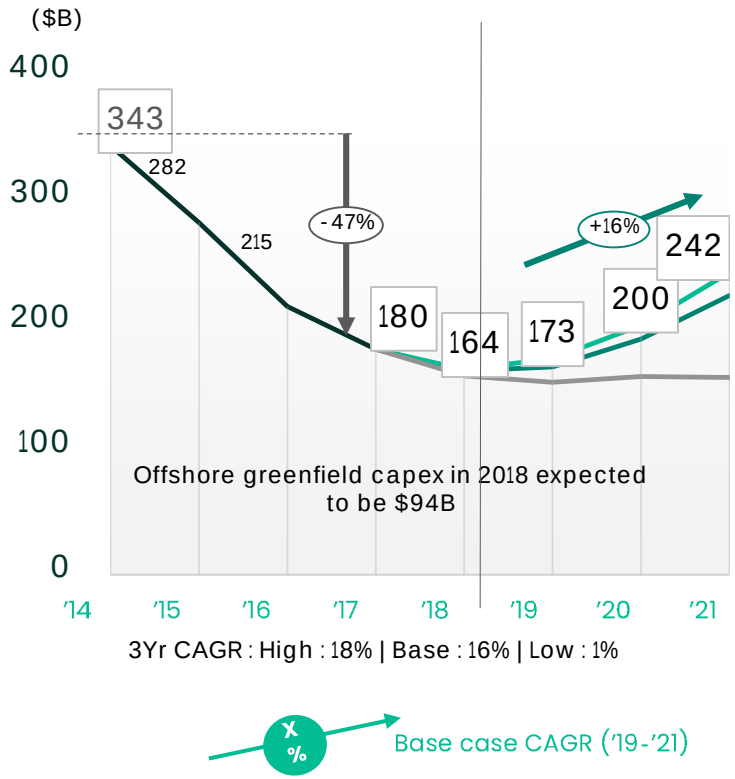
Subsea developments in the petroleum supply ecosystem

Market shifts	Shifts from shallow to deep and ultra deep Majors preparing for deepwater action at the right economics	Enhanced recovery for brownfields New tie-backs present opportunities to maximize recovery from existing investments	Subsea competitive with average costs of North American shale Driven by improvements in cost and productivity but with longer payback period
Change makers	The low carbon transition Operators looking for technologies and efficiencies to lower carbon emissions	Game changing technology Advanced technology in drilling and intelligent design engineering across subsea architecture are improving efficiencies	Poised for digital disruption Virtual monitoring, digital twins, and AI unlocking productivity, improving safety

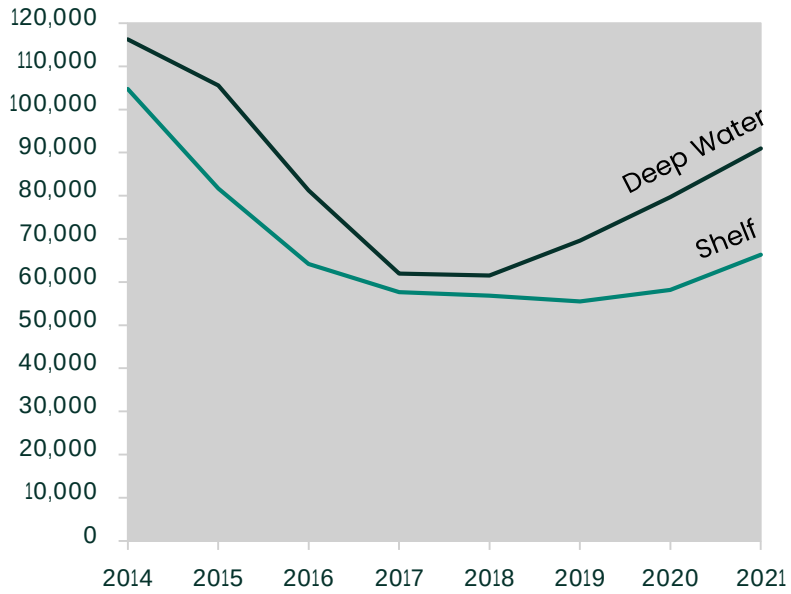
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Global offshore capital investment projected to grow at a CAGR of 16% with Deepwater segment leading the growth

Global offshore (E&P CAPEX)[1] '14 - '21



Global offshore (E&P CAPEX)[2] by water depth –'14 –'24



Sources:
(1) BHGE analysis based on Rystad UCube – August 2018; Upstream Spend based on Rystad Brent Price assumptions: 2018 = 75 $/bbl., 2019 = 79 $/bbl., 2020 = 79 $/bbl., 2021 = 77 $/bbl. ; IHS Markit Upstream Spend report (August, 2018)
(2): Rystad D cube 02-Oct-2010

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The industry has made significant progress in reducing breakeven costs for subsea developments.

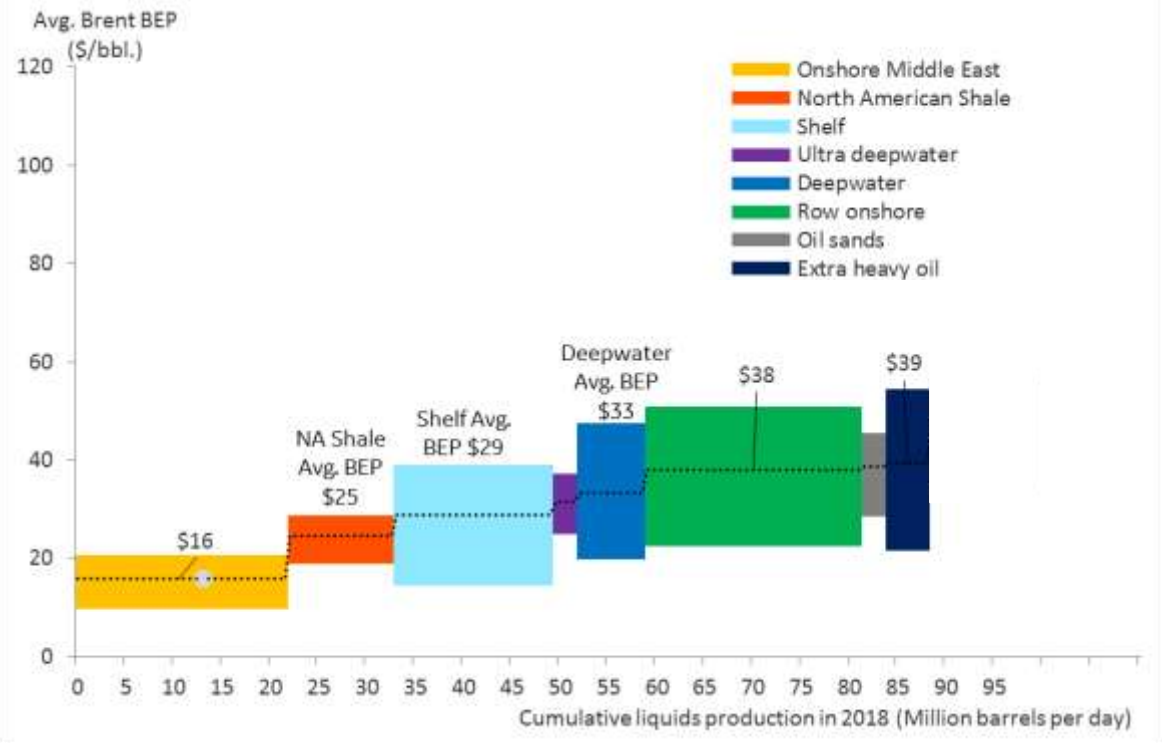
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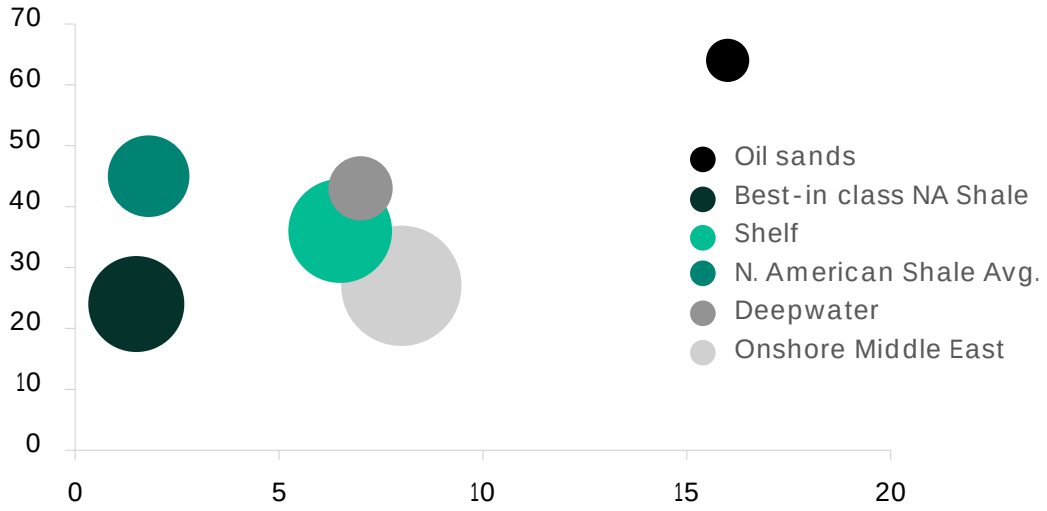
Breakeven costs have come down

Subsea developments in the petroleum supply ecosystem

2018 Cost of Oil Supply—Sanctioned Projects[1]



2020 Cost of Supply Unsanctioned Breakeven vs. Payback[1]



Source: 1 Rystad Ucube (August 2018), each production block includes Producing, Sanctioned and Unsanctioned projects

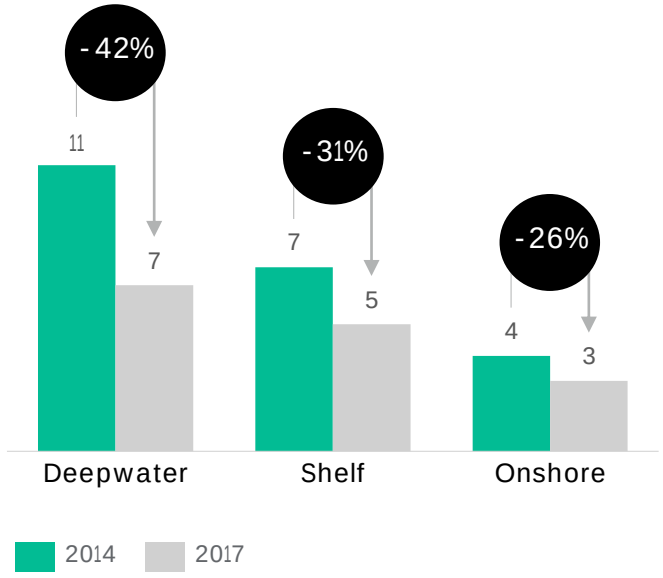
Production costs across asset types have converged, with majority of asset classes on average breaking even at sub 50$/bbl. oil prices

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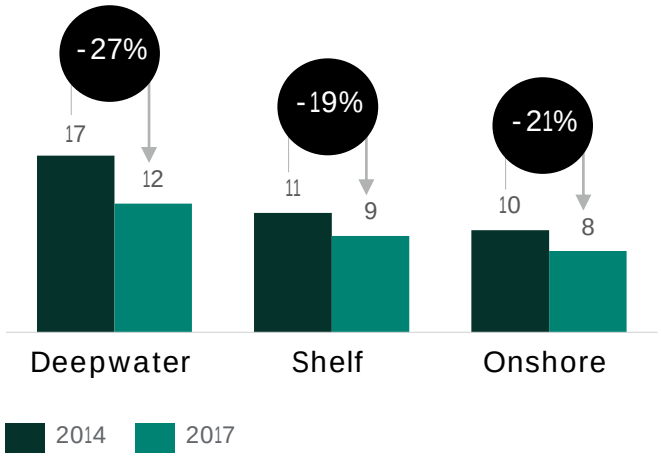
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Greenfield and Brownfield cost reduction trends

Greenfield development costs ($/boe.) by segment and year



Brownfield Production OPEX ($/boe.) by segment and year



Increased standardization, simplification of project designs, and supply chain improvements have lowered costs since 2014

From May 14, 2018 Rystad Bulletin - Edited and Published by Petroleum Review, May 2018 Edition

Authors: Aditya Ravi, Senior Analyst & Lars Mikkel Reiersen, Analyst, Rystad Energy

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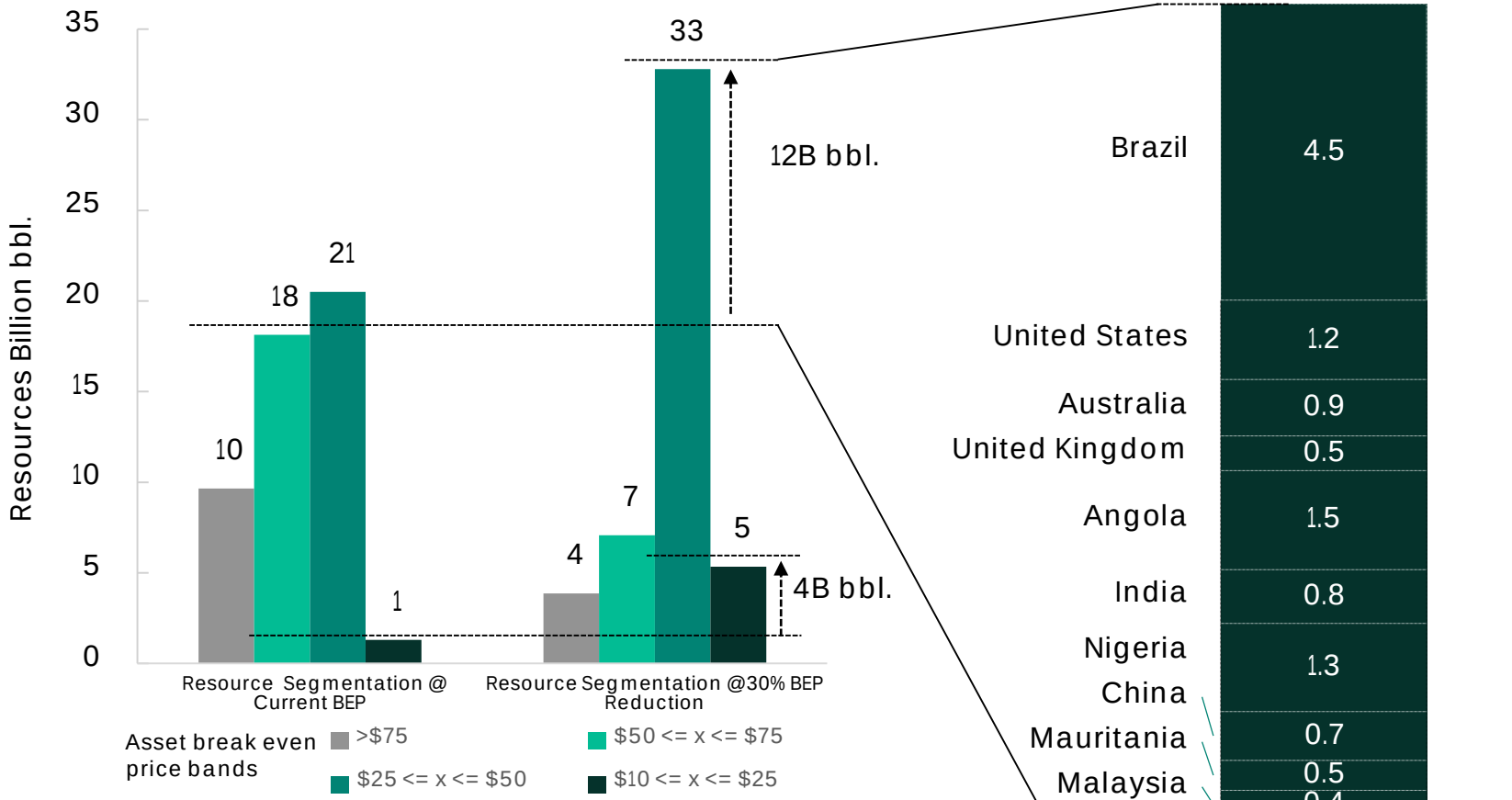
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We believe there's
more to do.

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Unsanctioned subsea projects 2018



Source : Rystad Ucube (October 2018), Brent oil price at $75

Unsanctioned subsea projects 2018 by country

Reducing the economic development point of unsanctioned assets by 30% unlocks 16B bbls of reserves

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To achieve this, we need a new way of doing business.

A new way to lower costs, increase productivity and yield to lower the economic development point.

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Introducing Subsea Connect.
Our vision for the future of subsea.

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Introducing Subsea Connect

Subsea Connect is a new way of doing business.

From the earliest stage, Subsea Connect takes the most comprehensive approach to configure projects to meet economic targets.

Better connections across the development process and more integrated solutions from the reservoir to topsides.

Reducing time and risk. Eliminating recycle. Increasing certainty.



Subsea Connect:

Influences **80%** of project development costs and value drivers.

Reduces the economic development point by an average of **30%**

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Subsea Connect reduces the economic development point by an average of 30%.

Add value to planned developments. Transform marginal uneconomic assets into opportunities.

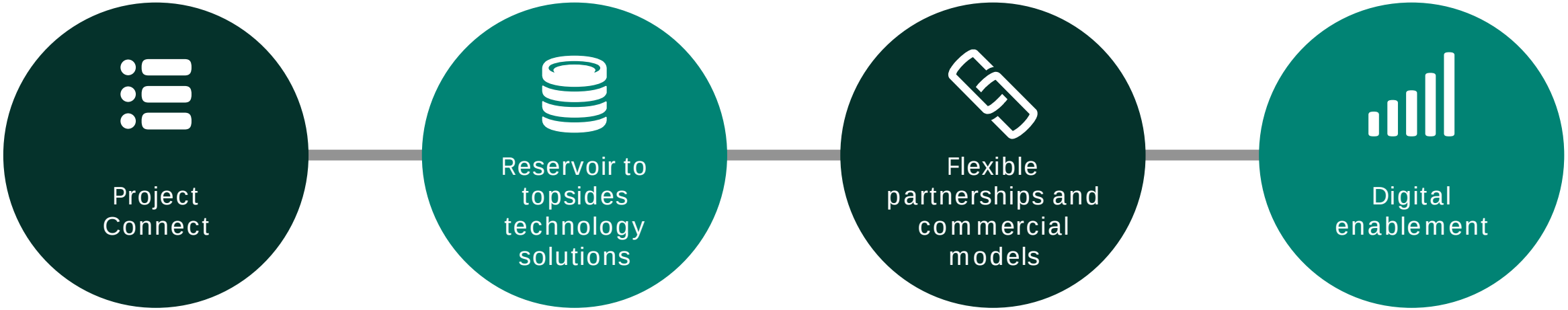
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Introducing Subsea Connect: how we deliver

From concept to commissioning. From the reservoir to topsides. Across the life of the field.

SUBSEA CONNECT PILLARS



Radically optimized | Outcome engineered | Life-of-field solutions

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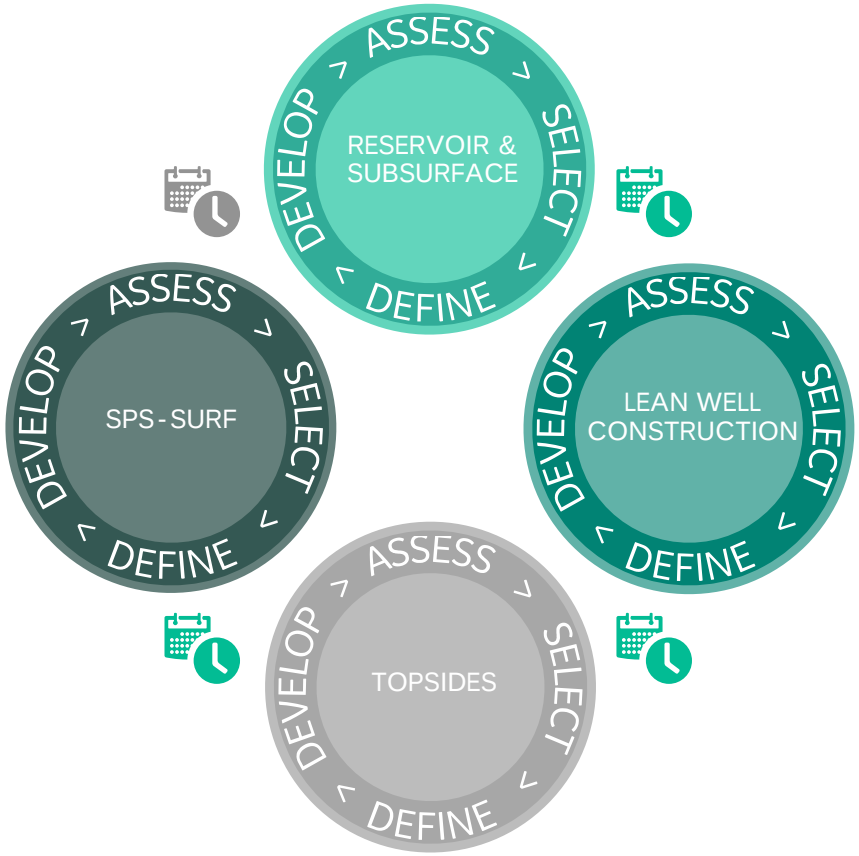
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It starts here.

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Project connect



Baker Hughes's independent project workflow changes the way subsea projects are developed by going beyond early engagement with an operator to reimagining how projects are planned and executed.

TRADITIONAL APPROACH → SUBSEA CONNECT

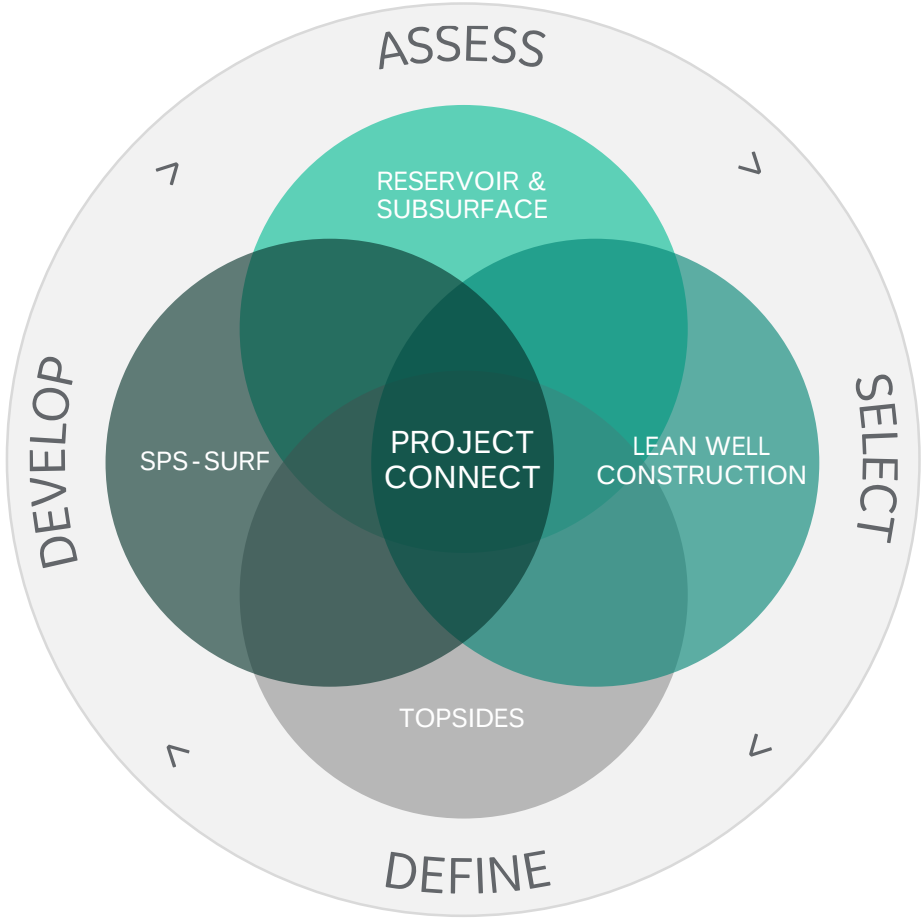
VS.

THE RESULT:

Lower cost

Increased productivity

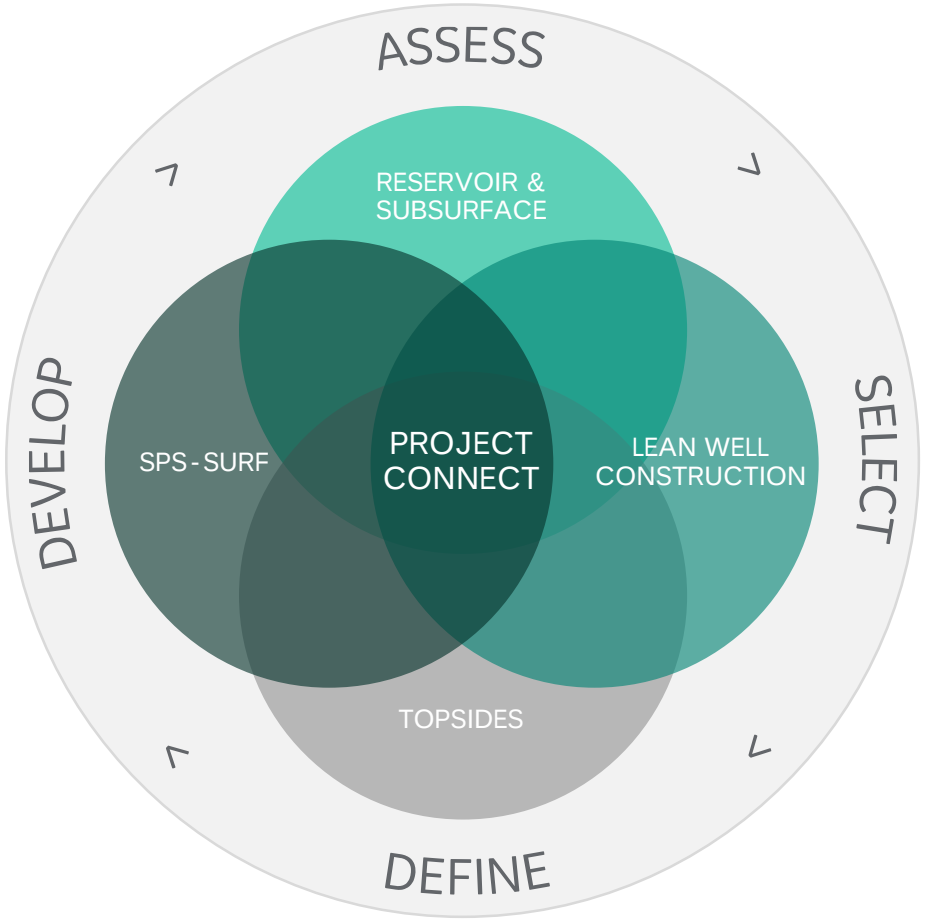
Improved yield



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Project connect



Key features

- Economic outcome assessment
- Parallel tracks to compress “assess” phase
- ‘All hands’ dedicated project teams
- Independent project management ability
- Technology system configuration and project integration
- Flexible. Partners and solutions for the project’s needs

Benefits

- Execution certainty embedded
- Collaborative and common purpose
- Speed—get to FID faster
- Improved schedule

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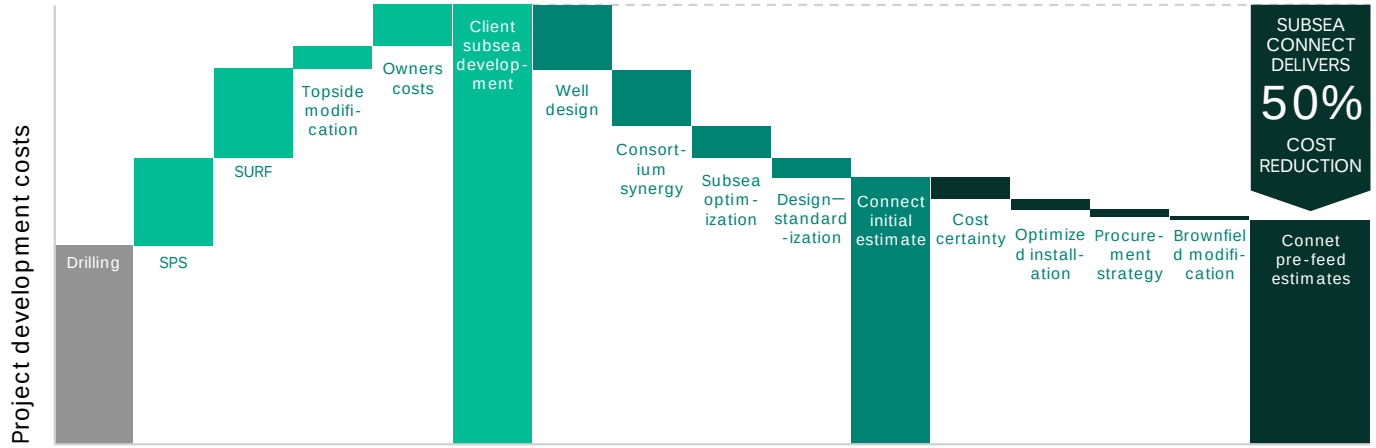
Case study

Subsea Connect transforms uneconomic North Sea asset: 3 well subsea tie back

Independent assessment process identifies opportunities for improvement

- Project stalled since 2015 due to poor economics
- Optimization—Baker Hughes and io Oil and Gas apply Subsea Connect independent assessment and Project Connect workflow, to identify project improvements—40% cost reduction
- Total Scope and Execution—line of sight to further 10% cost improvement identified through execution process
- Assessment showed earlier FID could be enabled

Impact of Subsea Connect on materially lowering the economic development point



Key factors impacting economic development point

50% CAPEX reduction	IRR improved 65%	FID-enabled
NPV improved 200%	Reduction in development costs: $30/bbl to $15/bbl	Development economic

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Reservoir to Topsides Technology Solutions for the life of the field

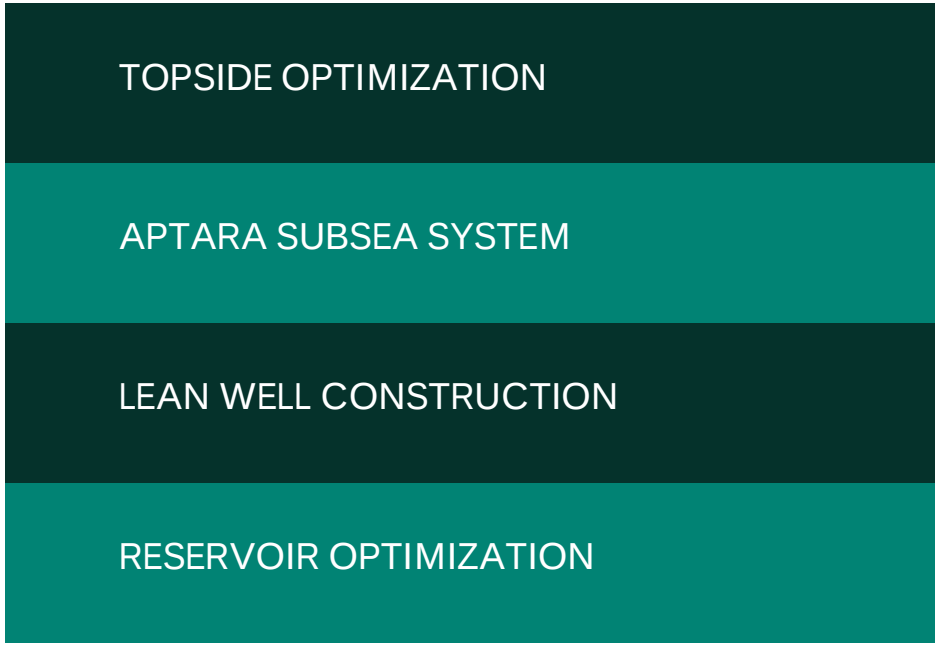
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Subsea Connect reservoir to topsides technology solutions

Baker Hughes fullstream: connecting a series of technology solutions, each designed to improve productivity and lower TOTEX

- Reservoir optimization and field development—Reservoir insights and optimization to enhance drainage and recovery over the life of the field.
- Aptara™ **TOTEX**-lite subsea systems—lightweight, modular technology re-engineered to cut the total cost of ownership in half and be more responsive to changes over the life of the field.
- Lean well construction—drilling to the technical limit; integrated with the rig to target a 20% reduction in well construction costs.
- Topside optimization and production enhancement—debottlenecking, gas handling and power solutions; extend asset life with no change in platform footprint to handle 25% more volume at minimal CAPEX.



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Case study

Reservoir optimization and field development Malaysia, Petronas D18

Baker Hughes capability

- Baker Hughes' Oilfield Services (OFS) Baker Hughes and market leading consulting partners (Gaffney Cline & Associates and io Oil and Gas) work across the fullstream oil and gas value chain, from reservoir evaluation to technology selection, and integration
- Technical competency and operational excellence—independent reservoir optimization and assessment, and field development planning
- Draw execution and supplier know how in as early as possible to help identify, then deliver value
- Software solutions—JewelSuite—turns data into actionable insights. Run multiple scenarios to analyze alternative possible outcomes at speed.
- Scale and expertise through portfolio of successful global projects. Leverage global relationships, synergistic partnerships.

Malaysia, Petronas D18

- Deployed team of ~20 petroleum, drilling, reservoir and facilities engineering and geoscience disciplines for FDP
- Doubled production in two years to 8,000 BOE/day
- Extended field life by 10 years
- Increased Recovery Factor 50%+
- First-in-kind joint development with PETRONAS

Customer value	Increased recovery factor 50% +	Doubled production in 2 years	Increased RRR

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Case study

Lean Well construction Offshore Norway: Equinor

Baker Hughes capability

- Baker Hughes' Oilfield Services (OFS) product and services portfolio, including drilling, cement, fluids, completions, and wireline
- A dedicated Baker Hughes project management team adding value over pure bundled services
- Partnership between Baker Hughes, the operator, and the rig contractor

Equinor

- Offshore North Sea Contract: 6 years
- Initial drilling campaign delivered 8 months ahead of plan
- All wells to date have been delivered according to requirements
- 50% cost reduction
- 'Moving Perfect' improved by 25%
- World record 17½' sections



Customer value	Multiservice contract for well construction and project management	Improve safety Deliver "the perfect well"	50% reduction in well costs by 2018	Reliability Standardization

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Case study

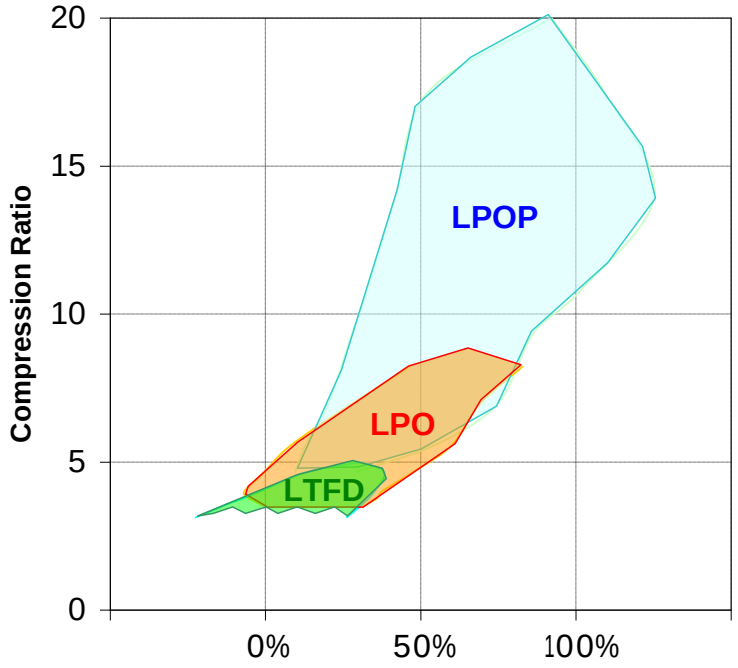
Optimized Topsides
Shell Brent

Baker Hughes capability

- Baker Hughes's Turbomachinery and Process Solutions (TPS) product and services portfolio provides gas handling, debottlenecking, production enhancement, and power generation
- From conceptual to turn-key solutions—site preparation, system integration, construction, testing and transport, and installation
- Upgrade and TOTEX light replacement solutions to enhance production

Shell Brent case history

- Extending reservoir life—progressive matching of compressor capacity to reservoir
- 50% smaller footprint and 30% less weight compared to two traditional units
- Doubled pressure ratio
- Leading edge technology—from 6 to 8 impellers



Customer value		
	Production efficiency/improvement	Emission reduction
	Fuel/power savings	Smaller footprint on topsides
	Life extension	Improved reliability and availability

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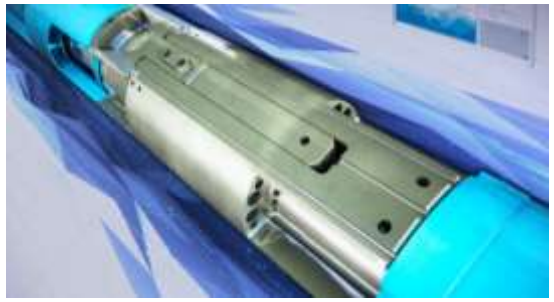
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OFS case studies



Developing new, sustainable operational models to greatly improve efficiency

Our customers are looking to the energy transition, and we have pledged to partner with them on this journey. We are working with customers like Equinor in the North Sea to transfer expertise from the rig to remote operations centers onshore, improving efficiency and decision-making while reducing HSE risks and carbon footprint.



SureCONNECT system allows operators to optimize performance, mitigate risks

Baker Hughes and BP deployed the SureCONNECT™ system in the Clair Ridge development offshore Scotland, marking the world's first multi-trip completion installation with fullbore fiber-optic capability. This is an immense milestone for BP's plan to improve surveillance data and well-performance functionality.



Strategic partnership with ADNOC Drilling results in best-in-class performance

ADNOC and Baker Hughes are working together to deliver more competitive well completion times, greater drilling efficiencies, and better well economics. Recently, ADNOC Drilling announced the completion of its first offshore integrated drilling services well following the successful completion of 14 onshore wells.



Expert, experienced operations personnel collaborate to smash record

Baker Hughes personnel partnered with an operator in the Northeast U.S. to deply an integrated drilling solution, including the AutoTrak™ Curve rotary steerable system, Navi-Drill™ Ultra high-performance motor, and Dynamus™ PDC drill bit, to drill a record-breaking 10,067 ft in 24 hours.

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Oilfield Services case studies

Accelerated operations by

30 days

Preventing downtime during Hurricane Harvey with DEEPFRAC

With Hurricane Harvey looming in the Gulf of Mexico, the DEEPFRAC™ deepwater multistage fracturing service helped a customer avoid downtime on a deepwater well. The well plan stayed on track and the service accelerated completion operations.



Using data-driven models for greater recovery in the Middle East

Detailed geological, geomechanical and reservoir studies on a mature gas field identified several untapped reservoirs. BHGE engineered a cost-effective coiled tubing re-entry drilling solution to access these geologically-complex targets. The six-well pilot phase of the production enhancement program is expected to yield 35 BSCF of gas and ~800,000 barrels of oil.



Drilling a well in the fastest **time ever recorded in Kuwait's** North Field

Kuwait Oil Company achieved the highest rate of penetration ever recorded in Kuwait's North field with the Middle East region's first deployment of the BHGE TerrAdapt™ adaptive drill bit combined with the BHGE AutoTrak™ eXpress rotary steerable system.

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Norway: Johan Sverdrup

Project details

- Integrated well construction project
- Offshore North Sea
- Contract: 6 years (with option to extend to life of field)
- 50 years estimated field life
- A trilateral partnership between BHGE, the operator, and the rig contractor

Baker Hughes scope

- Baker Hughes' Oilfield Services (OFS) product and services portfolio, including Drilling, Cement, Fluids, Completions, and Wireline
- A dedicated BHGE project management team adding value over pure bundled services

Challenges

- Multiservice contract for well construction and project management
- Flawless HSE
- Deliver "The Perfect Well"
- 50% reduction in well costs by 2018
- Reliability
- Standardization

Results

- No serious injuries or incidents to date
- Initial drilling campaign delivered 8 months ahead of plan
- All wells to date have been delivered according to requirements
- A 50% cost reduction
- 'Moving Perfect' improved by 25%
- World record 17 ½' sections



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OFE case studies



Fueling Egypt's energy future

With our deep experience in large-bore gas systems and long offsets, we secured a major subsea contract from Petrobel for phase two of the "supergiant" Zohr gas field to provide project management, engineering procurement, fabrication, construction, testing and transportation of a subsea production system. We will also support the installation, commissioning and start-up operations.



Delivering fullstream solutions in Mozambique

We signed two major contracts with Eni East Africa: the first, to supply subsea production systems and services for the offshore Mozambique development; the second, for rotating equipment, including aeroderivative gas turbines for power and gas refrigeration for the first African-built FLNG facility.



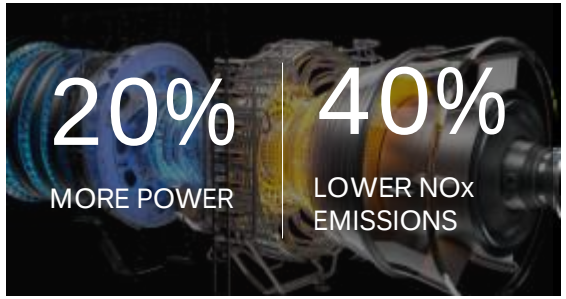
Driving the Future of Subsea

We launched Subsea Connect, a new approach to subsea developments. It combines planning and risk management, new modular deepwater technology, innovative partnerships and digital tools into a single offering to improve the economics of subsea projects. A cornerstone of Subsea Connect is the Aptara™ TOTEX-lite subsea system, a suite of new lightweight, modular, technologies designed to be more responsive to changing conditions across the life of field, cutting total cost of ownership by up to 50%. We are gaining momentum with this approach and deploying it across new and existing projects.

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TPS case studies



Launching the LM9000

We introduced the super-efficient LM9000 aeroderivative gas turbine to support large-scale projects. It provides a 20% reduction in the total cost of ownership for LNG operators.



Hydrogen Turbine

Our NovaLT gas turbine product family for 20 MW and below sets new standards in cost-effectiveness while providing higher efficiency and longer operational uptime. We're now extending the NovaLT gas turbine generator technology to also operate 100 percent on hydrogen for the Port Lincoln Project, a green hydrogen power plant facility in South Australia. Building on our previous experience with hydrogen-fueled generation in Italy's Fusina project - in operation since 2008 - we can deliver the same world-leading capabilities and the design features of the NovaLT platform while operating on 100% hydrogen.



Low Carbon technology

With 40% lower requested maintenance than conventional compressors, our Integrated Compressor Line (ICL) provides exceptional reliability and availability no matter where it's installed. And it does all this while producing zero emissions.



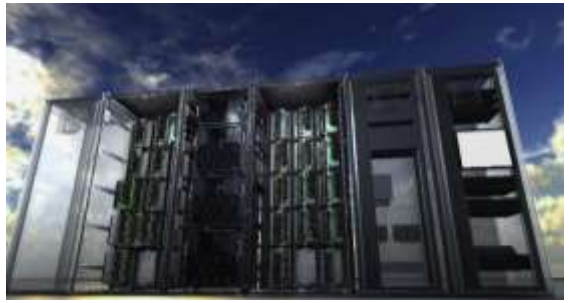
Expertise on demand

Field service goes digital—our smart helmet technology helps optimize our specialized service support by connecting customer sites with BHGE OEM experts, improving efficiency, productivity, and safety.

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DS case studies



Increasing reliability and **efficiency for world's largest** nuclear power facility

In 2018, M&C was awarded a multi-unit upgrade project at for Bruce Power in Canada. The project includes our industry-leading control systems, Bently Nevada condition monitoring technology, and our Security ST cybersecurity protection suite.



Expanding our portfolio of clean energy solutions with LUMEN & Flare.IQ

LUMEN technology, a ground- and drone-based advanced methane detection system, helps our customers reduce their impact on the environment and supports our low-carbon goals. In addition, we offer Flare.IQ, an emissions reduction system with hundreds of installations today.



Condition monitoring helps grow renewable energy

Today, M&C's Bently Nevada condition monitoring systems are installed on 10% of the world's wind turbines. We help wind farm owner-operators reduce maintenance and repair costs, contributing to a significant decrease in the lifetime cost of ownership and ensuring renewable energy can grow profitably and efficiently.

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