



**Baker Hughes
enhanced
coring services**

**Providing the
definitive answer**

Baker Hughes provides drillers and geoscientists with an unprecedented wealth of continuous, real-time data about—and visibility into—the downhole environment. Measurement-while-drilling (MWD) and logging-while-drilling (LWD) information allow precise navigation, immediate evaluation, and on-the-spot decision making while drilling. But when real-time answers require validation, and a final, definitive answer is needed, coring is essential.

That is why coring is an integral part of the Baker Hughes drilling and evaluation services. Real-time MWD and LWD data show the exact location and characteristics of the formation and the downhole environments. Complete high-quality core samples then confirm the formation's lithology and mineralogy, flow characteristics, storage capacity, production potential, and more.

Geologists and petrophysicists will use the core analysis data to interpret and correlate the well logs. The reservoir and drilling engineers can then fine-tune future drilling and well placement operations—facilitated by the precision of drilling and evaluation technologies.

Experience is all part of the plan

With more than 60 years of coring experience, Baker Hughes is highly qualified to implement coring programs across the widest range of applications.

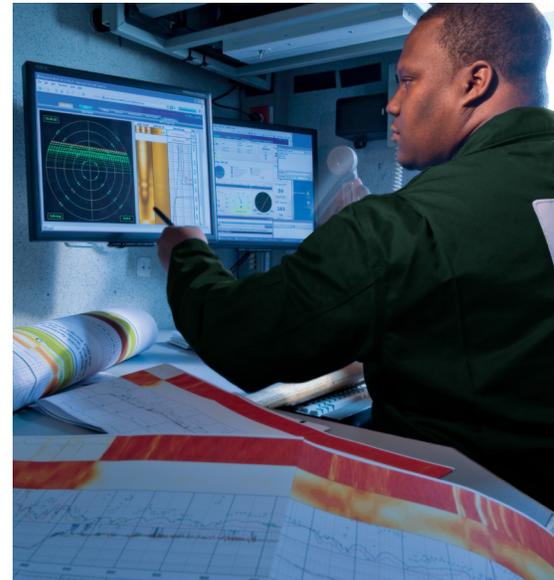
And with that experience comes the knowledge that planning is the key to a high-quality, cost-efficient, and time-saving coring operation.

Long before drilling operations begin, Baker Hughes coring specialists consult with project drilling and coring engineers to determine the coring technologies and systems that will ensure a successful coring program. We work with program teams to optimize coring technologies that meet drilling program objectives faster and with lower rig costs—all while planning and conducting rigsite safety plans throughout the operation.

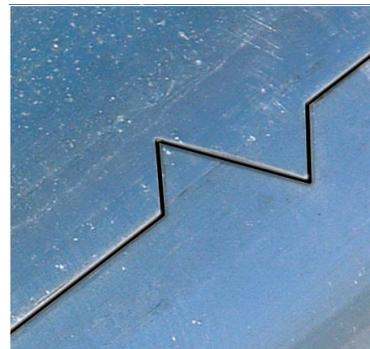
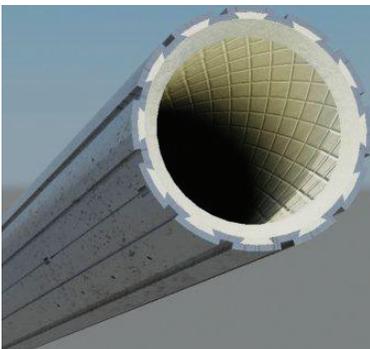
Fit-for-purpose services

The Baker Hughes coring technologies offer fit-for-purpose solutions for the challenges of coring in difficult or fragile formations, increasing coring efficiency, and reducing or eliminating non-productive rig time during coring operations.

We offer a wide range of advanced coring technologies that give operators the tools to maximize recovery and efficiency while ensuring core sample quality. The objective is to deliver high-quality samples for accurate reservoir analysis while controlling core acquisition costs.



Result: confidence that quality core material will be recovered in an optimal manner to mitigate risks and control costs





Proven coring answers

Baker Hughes offers clients a complete line of fit-for-purpose coring solutions including the proven **HT Series™ high-torque outer-barrel coring and nonrotating inner tube stabilizer (NRITS) systems** for dependable core recovery in a wide range of formation types. In addition, a specialized line of core bits incorporates best-in-class cutter technology for enhanced core quality and cutting performance.

Rugged core barrels

The HT Series high-torque, heavy-duty core barrel systems are designed for all coring applications.

The systems accommodate full-diameter cores, as well as optional and special application coring components.

Because they can operate at higher rates of penetration and weight on bit without torque damage to core barrel connections, HT Series systems deliver consistent penetration rates for conventional, unconventional, and hard rock applications.

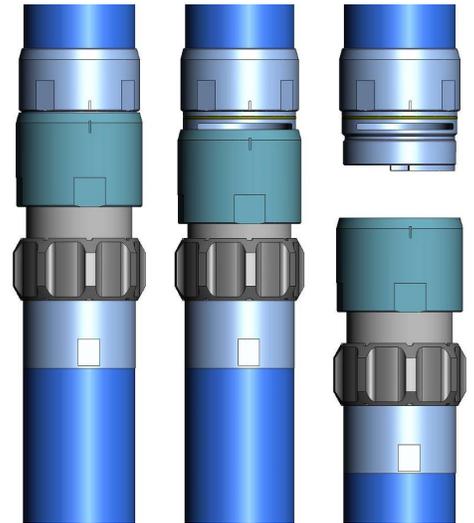
Efficient core bits

Baker Hughes core bits designed with premium PDC cutters minimize vibration and resist abrasive wear and impact under the most demanding downhole conditions. Baker Hughes bits are engineered to run smoothly, minimizing bottomhole assembly (BHA) vibration while coring. The highly durable polished cutters employ an advanced PDC design with unique edge geometry and special hydraulic

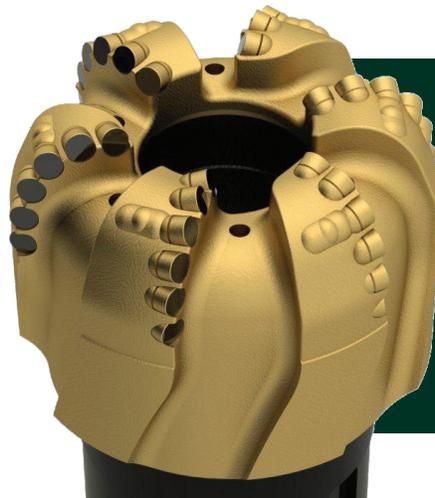
design to improve cuttings removal, increase penetration rates, and deliver superior cutting efficiency while resisting impact load and abrasion. These features lead to less filtrate invasion of the core and reduce the damaging effects that can shorten bit life in hard formations.

Inner barrel stabilization

Serious damage to the core can result if the inner barrel rotates with the outer barrel, or if excessive vibration occurs. The NRITS system is employed to prevent inner barrel rotation and provide superior stabilization. Use of the NRITS system significantly enhances the buckling resistance of longer inner barrels, increasing coring efficiency and reliability while improving core quality. It also prevents torque-induced damage to the core when the inner barrels are separated at the surface.



Non-rotating inner tube stabilizer



Result: minimized overall acquisition costs and superior core samples for comprehensive reservoir answers



Unmatched reliability and efficiency in challenging formations

The objective of any coring program is to maximize recovery of quality core samples across a wide variety of formation types, including the most difficult to core. Many of the world’s producing formations are unconsolidated, fractured, or held together by viscous oils without the strength to be recovered by conventional core catchers. Hard rock presents its own challenges, including slow penetration rates and excessive BHA vibration. Baker Hughes offers the most advanced, fit-for-purpose core recovery systems to capture quality core samples from virtually every formation.

Fewer trips due to core jams

The **JamBuster™ anti-jamming coring system** incorporates telescoping inner core barrel sleeves to mitigate the effects of core jamming and eliminate unscheduled trips out of hole. The JamBuster system concentric inner core barrel sleeves automatically telescope if a core jams in the inner barrel, allowing coring to continue without interruption. Up to four jams can occur, depending upon core barrel size, before the core barrel must be tripped out of hole.

Full-closure coring

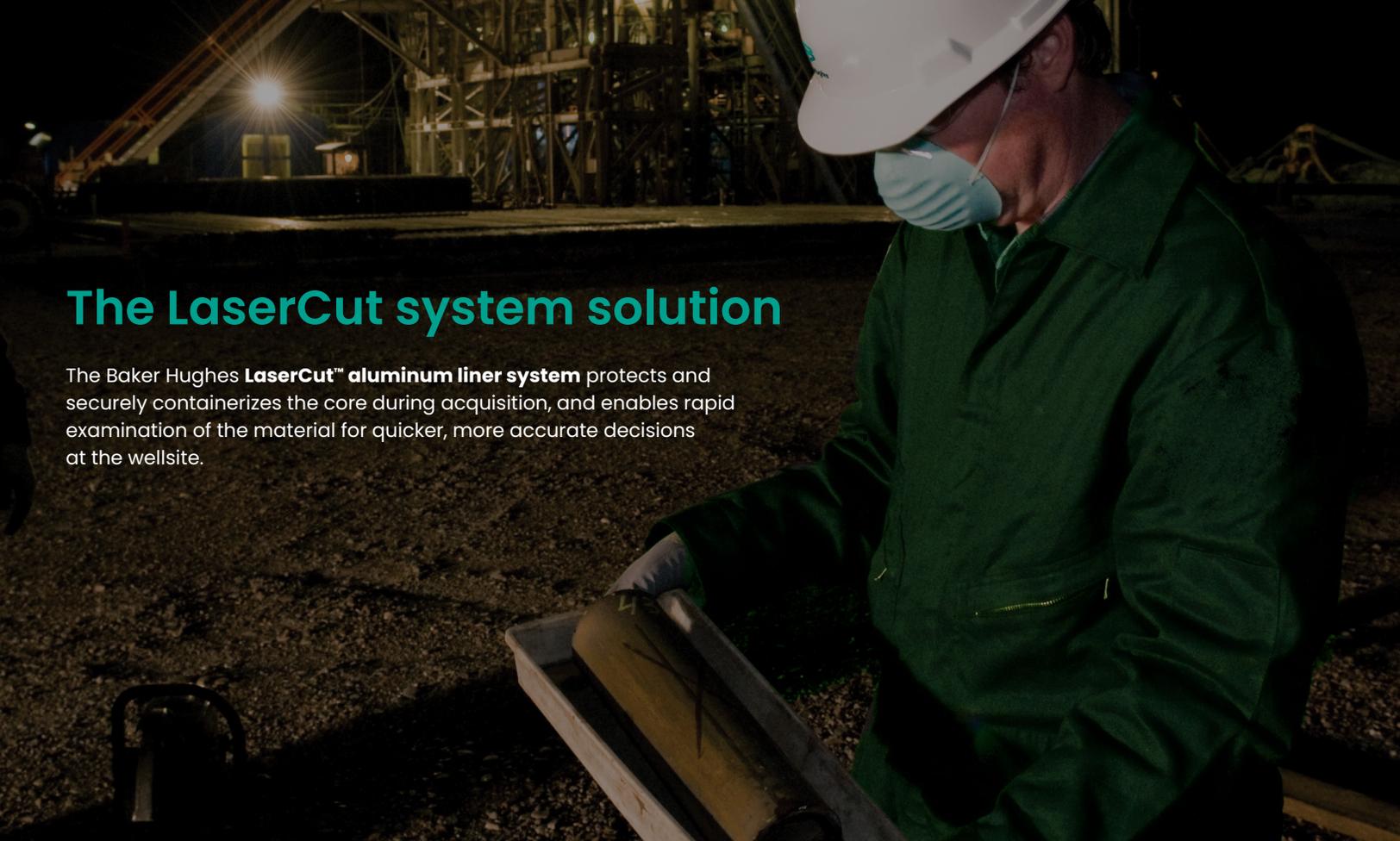
When coring unconsolidated formations, core material often falls through conventional core catchers.

The **HydroLift™ full-closure core catcher** eliminates the problems associated with recovering poorly consolidated core material by completely sealing the inner barrel before retrieval to surface. The system features a slick, unobstructed core entry to prevent jamming in the bit, as well as a secondary, backup spring-type core catcher to recover consolidated formation material.

HT Series core barrels

Barrel	Hole diameter	Barrel diameter	Core diameter
HT12	6 in. - 7 ⁷ / ₈ in. (152.4 mm - 200.0 mm)	5 ¹ / ₄ in. (130.2 mm)	3 in. (76.2 mm)
HT30	8 ¹ / ₂ in. - 9 ⁷ / ₈ in. (215.9 mm - 250.8 mm)	6 ³ / ₄ in. (171.4 mm)	4 in. (101.6 mm)
HT30 Max	8 ³ / ₈ in. and larger (212.7 mm and larger)	7 ¹ / ₄ in. (184.2 mm)	4 in. (101.6 mm)
HT40	9 in. - 12 ¹ / ₄ in. (228.6 mm - 311.2 mm)	8 in. (203.2 mm)	4 ³ / ₄ in. (120.6 mm)
HT60	12 ¹ / ₄ in. - 17 ¹ / ₄ in. (311.2 mm - 438.2 mm)	9 ¹ / ₂ in. (241.3 mm)	5 ¹ / ₄ in. (133.3 mm)

Built on 30-ft. (9.1 m) platforms



The LaserCut system solution

The Baker Hughes **LaserCut™ aluminum liner system** protects and securely containerizes the core during acquisition, and enables rapid examination of the material for quicker, more accurate decisions at the wellsite.

Core quality is key

For geologists, petrophysicists, and reservoir engineers, a core is the DNA of a reservoir, revealing the accurate lithology, porosity, permeability, saturation, wettability, and electrical properties that form the geologic model. And like DNA, any contamination or alteration of the core sample can skew the results. That's why Baker Hughes has developed technologies and services preserving the highest quality core samples.

Fit-for-purpose inner barrels and liners

Disposable inner barrels and liners protect the core material during recovery and handling, regardless of the characteristics of the formation. The containerized cores remain in the protective inner barrel or liner as they are recovered, preserving their integrity and properties. Baker Hughes offers a full range of inner barrels and liners—aluminum, disposable steel, and fiberglass. Specialized systems are available as well.

Low-invasion coring

Using a specialized drilling fluid, a low-invasion core bit, and an extended pilot shoe, the **CoreGard™ system** effectively minimizes drilling fluid filtrate invasion of the core samples. A specially designed, low-invasion core bit features face-discharge ports that direct drilling fluid flow to the cutter, away from the column of core being cut. The extended pilot shoe protects the core from excessive contact with the drilling fluid. The formulation of the drilling fluid encourages a filter cake to form on the core and protect it from filtrate invasion.

Superior sponge liner coring system

Baker Hughes developed the **sor™ (saturation oil remaining) sponge liner coring system** to provide a superior and more accurate method for measuring a core's total oil saturation. Incorporating the LaserCut sponge liner system, proprietary pressure-compensating piston design, and modified pilot shoe,

the system allows reliable reservoir core measurements that can be correlated to LWD or wireline logs, allowing for the accurate determination of the true yield of remaining reserves.

Result: more accurate assessment of formation wettability and water saturation

Clearing the way for faster evaluation

Coring operations do not stop with core acquisition and retrieval. Baker Hughes offers a complete range of core handling and evaluation services at the wellsite itself—services that can dramatically speed up the evaluation process to reduce idle rig time.

Splitable liner system

The proprietary LaserCut aluminum inner barrel liner system is designed to protect and containerize the core during acquisition, then provide for rapid examination and sampling of the core material at the surface. The liners are run in-hole as integral one-piece units. At the surface, however, they can be easily and quickly separated along lengthwise laser cuts to expose the core samples. This allows for rapid examination of the core and timely, cost-saving decisions regarding further coring or drilling operations.

Wellsite gamma logging

The **GammaTrak™ wellsite gamma logging units** provide evaluation of formation gamma response versus core depth. These units are used to scan the core-filled inner barrels as they are pulled from the BHA (vertical orientation), or after the inner barrels have been laid on the rig floor (horizontal orientation). The resulting gamma versus depth logs can be compared to offset LWD or wireline logs to verify that the target formations were cored. An enhanced version of the service is certified for hazardous locations and communicates in real time with a remote laptop using wireless technology.

Wellsite core processing and preservation

Proper handling of the core at the wellsite is as critical as its acquisition and must be planned with the goals of the evaluation program in mind. A core that is damaged by inappropriate handling techniques, exposed to air, or otherwise contaminated by external materials can become useless for evaluation. Experienced Baker Hughes wellsite coring experts are solidly trained in the surface handling and processing of cores for immediate evaluation or shipment for off-site analysis.

At the rigsite, Baker Hughes experts use core recovery systems to secure the inner tube during removal, and immediately stabilize the cores by injecting quick-setting epoxy, foam, or gypsum into an inner barrel. To further prevent filtrate invasion, special plug samples may be prepared immediately. Baker Hughes provides a full range of core processing equipment on-site, which can be vital when drilling in remote locations.

For more information on how Baker Hughes can provide definitive answers with enhanced coring services, contact a representative today.



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