

DIRECTIONAL DRILLING

Experts in accuracy and unparalleled service.
UPTIME. EVERY TIME.

 **ENSIGN**[®]

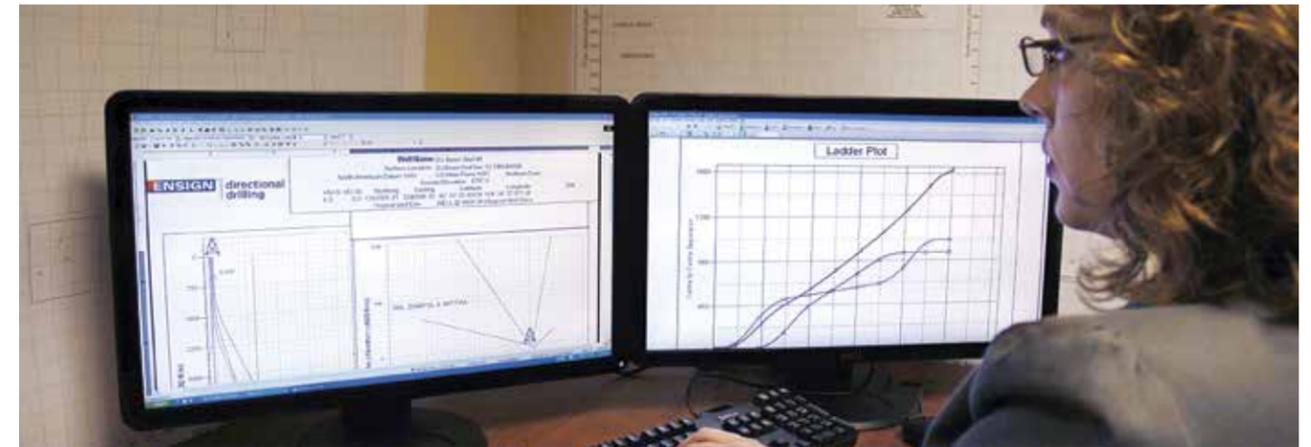


At Ensign we're proud of our efficiency. We're so confident in our integrated drilling rig and directional drilling services that we offer the Terminate Code 8 Guarantee, crediting customers for any directional drilling downtime.

We're a North American leader in horizontal and directional drilling and among the strongest consolidated energy services companies with rigs operating worldwide, including our flagship Automated Drilling Rigs (ADRs®).

We're a team of innovators with expertise in deep, complex and challenging wells. Committed to consistency, we work hard to ensure that every aspect of the pre-planning process is aligned to ensure downtime is minimized and production is maximized.

You can count on us to deliver. Every time.



WELL PLANNING:

Expert teams deliver a seamless experience

Ensign's directional well planning team works collaboratively with you to understand the operational expectations and the technical challenges of your specific formations. We bring extensive knowledge and hands-on experience to each directional drilling plan.

Every detail and aspect are expertly planned and plotted to get your wells designed properly. Each well includes a detailed plot highlighting critical information such as: hard boundaries, existing wells, formation tops and surface layouts for drilling pads. We're especially detailed in anti-collision planning to ensure your wells are planned accurately, efficiently and safely.

In addition to our standard Measurement While Drilling (MWD) surveys, Ensign offers Interpolation In-Field Referencing (IIFR) and real-time Multi-Survey Analysis (MSA) for increased quality and accuracy.

The result is optimal wellbore placement, improved reservoir recovery and mitigated risk of collision in highly congested reservoirs.

Comprehensive Services

Customers combining Ensign's directional and rig services benefit from a seamless turnkey operation, efficiencies and cost savings. We 'right size' our crews for each specific drilling program, ensuring maximum efficiency and safety.

From pre-planning to review of performance on completion of the well, Ensign's directional services encompass all aspects of the process:

- Remote computer-based monitoring capability and skilled crews
- Well plans developed in-house using the latest directional software, including anti-collision, torque and drag analysis, multi-leg wells, high density pad design and pad design optimization
- Downhole Measurement While Drilling (MWD) and high performance motors matched to specific applications, well design and rig capabilities
- State-of-the-art Electro-Magnetic (EM) and Mud Pulse MWD technology with gamma modules including inclination and gamma at bit measurements
- Conventional directional and horizontal drilling
- Multi-well pad drilling
- Underbalanced directional and horizontal drilling
- Slim-hole re-entry services
- Short-radius drilling applications
- Well monitoring
- Performance motors

MWD + IIFR + MSA
 Measurement While Drilling Surveys Interpolation In-Field Referencing Multi-Survey Analysis

ACCURACY & QUALITY

-1500

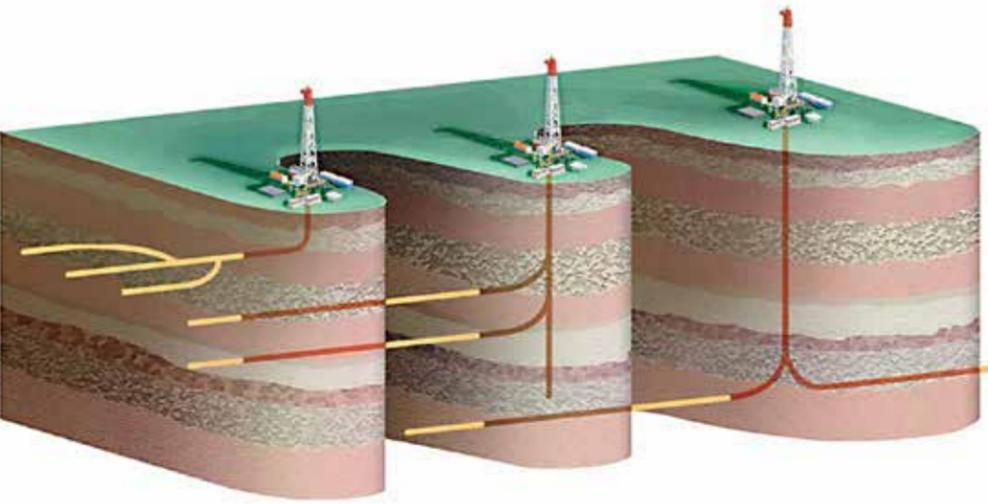
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West(-)/East(+) (65 m)



Easy-To-Read Torque And Drag Analysis Features

- Survey tortuosity
- Drilling, back reaming, rotating and tripping operations
- Soft and stiff string models
- Buckling calculations
- Side-Force analysis report
- Sensitivity analysis on friction factor
- Friction factor calibration
- US oil field, SI and customized units
- Excel®, text or PDF® file

**TORQUE AND DRAG ANALYSIS
Better data, lower risk**

Today's extended-reach direction wells, s-wells and longer lateral horizontal wells expose tubulars to increasingly greater tensile and torsional loads.

Ensign's Directional Drilling package includes optional Torque and Drag Analysis, providing accurate modelling and analysis of the loads acting on the tubulars to mitigate risk and enable fast, effective decisions.

Our software and data-interpretation team can determine limitations in the length of a horizontal well based on friction factors and the required weight to the bit. By analyzing downhole tensile and torsional forces, you can calculate drilling rig specifications for torque and hook load.

**ENSIGHT MWD™ SERVICES
Built tough for demanding environments**

Ensign is a leading supplier of MWD services. We offer a range of systems for applications, including:

Mud Pulse MWD

Ensign's Mud Pulse MWD System has been built to operate in harsh environments, withstanding temperatures up to 150°C and pressures up to 20,000 psi. Our Mud Pulse tool accommodates several orifice/poppet combinations, ensuring top performance across various flow ranges and collar diameters. This system's downlinking capability allows for changes to the tool's operation without tripping instruments out of the hole.

Positive Pulse systems use pressure pulsations in the drilling fluid to transfer data to the surface. Mud Pulse MWD tools are ideal for use in slower foothills drilling, deep hole applications and areas where formations inhibit EM signals.

Available in outside tool diameters from 4.75" to 9.5"

Near Bit Sub

When combined with the EnSight MWD™ EM system, the Near Bit Sub enables measurement of inclination and gamma count data approximately two feet behind the bit. This provides accurate near-bit inclination and focused gamma ray with clear "up" and "down" readings, providing you real-time geosteering and collision avoidance in tight formations.

Available in two sizes:
3.5 API Regular and 4.5 API Regular

Electro-Magnetic (EM) MWD

Ensign's EM systems combine state-of-the-art EM technology with industry standard downhole sensors to provide an accurate, reliable and cost efficient MWD solution. The systems are highly effective in shallow gas and shallow horizontal wells. Recent technological advancements have allowed for deeper applications.

Using dipole electro-magnetic wave propagation, our EM systems transmit data from the downhole MWD tool to the surface. EM technology is designed for faster and deeper drilling in shallow gas and shallow horizontal wells.

EM wave propagation tools do not rely on drill fluid for signal generation allowing underbalanced drilling where the drill fluid has been aerated. EM MWD is highly efficient in areas of lost circulation.

Real-time annular pressure, drill collar internal pressure, rotation sensing and gamma are available with Ensign EM systems.

Available in outside tool diameters from 4.75" to 8"



ENFORCE™ MUD MOTORS Satellite-grade toughness

Recent technological advances have enabled the industry to drill more challenging formations using more complex directional drilling technology. To accommodate increased torque requirements, Ensign's innovative directional drilling team identified and tested new materials and incorporated them into the design of our EnForce high-performance positive-displacement mud motors.

Our motors incorporate a superior bearing-pack and drive system constructed with satellite-grade materials. Our adjustable bent housings deliver high makeup torques that reduce the risk of back-off.

Multiple fixed bend settings are available in 5" and 6.5" motors

Motor Shop

EnForce Mud Motors are built to perform. Ensign's dedicated motor shop, provides comprehensive pre-run and post-run inspections on all stators and rotors. We conduct failure analysis on all faulty equipment, including engineering and design changes for damaged components.

INNOVATIVE TECHNOLOGY for the most challenging formations



OPTIMIZATION REPORTING Maximized uptime and efficiency

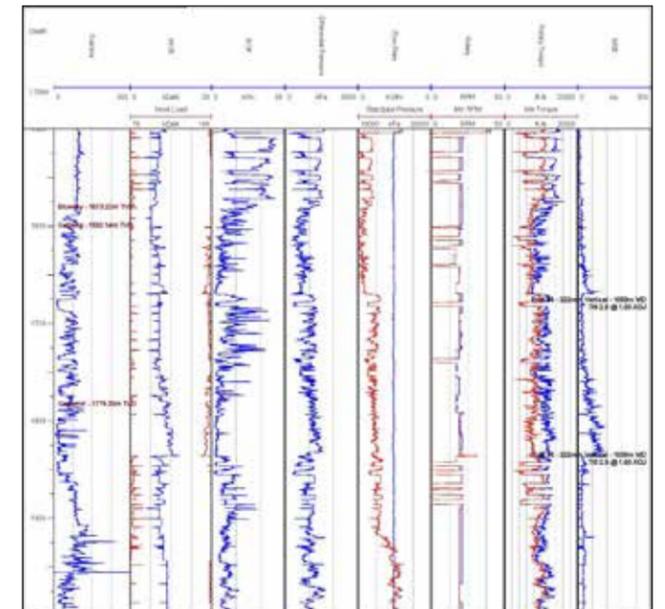
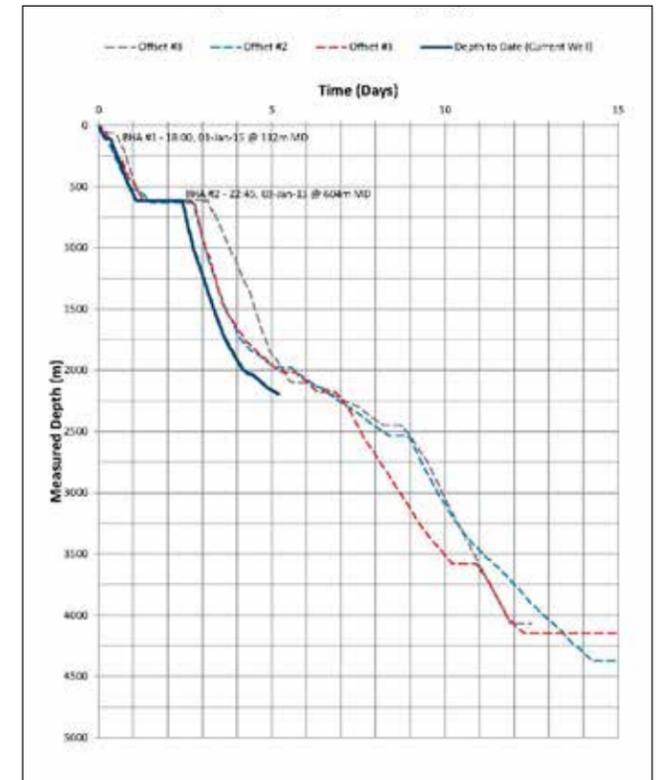
In directional drilling, comprehensive daily reporting is essential. Ensign reports are designed to improve Rate Of Penetration (ROP), reduce operating time and ultimately, exceed your expectations:

Daily Reporting delivers a summary of the well's days-versus-depth in a single-page report.

Section-By-Section Breakdown includes one page per section (surface, vertical, build and lateral).

Days-Versus-Depth Plot identifies potential performance problems using benchmarks. The plot compares the performance of the current well to past performance and includes statistics such as meters drilled and drilling times.

Drilling Curves provides a graphic view of operating conditions. It includes hole-section identifiers, Bottom Hole Assembly (BHA) information and formation tops. By overlaying previous wells, customers can identify areas of improvement.



PERFORMANCE RESULTS +
IN-HOUSE METRICS + HISTORICAL DATA
= OPTIMIZED REPORTS

Training

At Ensign, we're proud our people meet rigorous skill and safety standards; standards that provide our customers with a consistent level of service on all of their projects. We know that when our crews mobilize, our people are capable, experienced and ready to excel. Ensign believes quality training for our people means quality service for our customers.

This approach to customer service is rooted in Ensign's enterprise-wide Global Skills Standard (GSS). GSS is an approach to training that uses a

standardized curriculum to ensure and guarantee Ensign's people (specifically, rig crew) around the world, meet our global criteria for skills and competency, enabling us to provide a consistently high level of service in all our operations.

Our customers deserve the assurance that Ensign meets benchmark standards of performance, regardless of the size or location of an operation.

Health, Safety and Environment (HSE)

At Ensign, we're striving for a perfect Health, Safety and Environment (HSE) record.

In our industry, there's no compromise on health and safety. And Ensign is never complacent about safety performance. We believe all incidents are preventable. That's why we train our employees in a high-performance safety culture and are continuously Driving to Zero®.

Zero safety incidents. Zero injuries. Zero absences due to injury.

Training starts on the first day of employment and is continuously reinforced through rigorous job safety analysis practices, personal injury prevention training, safety coaching, pre-job safety meetings and work observation and intervention programs.

We take responsibility for our impact on the environment and actively work with our customers to reduce, reuse, recycle and reclaim materials used in our operations.



directional
drilling

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drilling | directional drilling | testing | well servicing

