Wellbore Integrity
SOLUTIONS

JANUARY - DECEMBER 2025

CASE STUDY PORTFOLIO

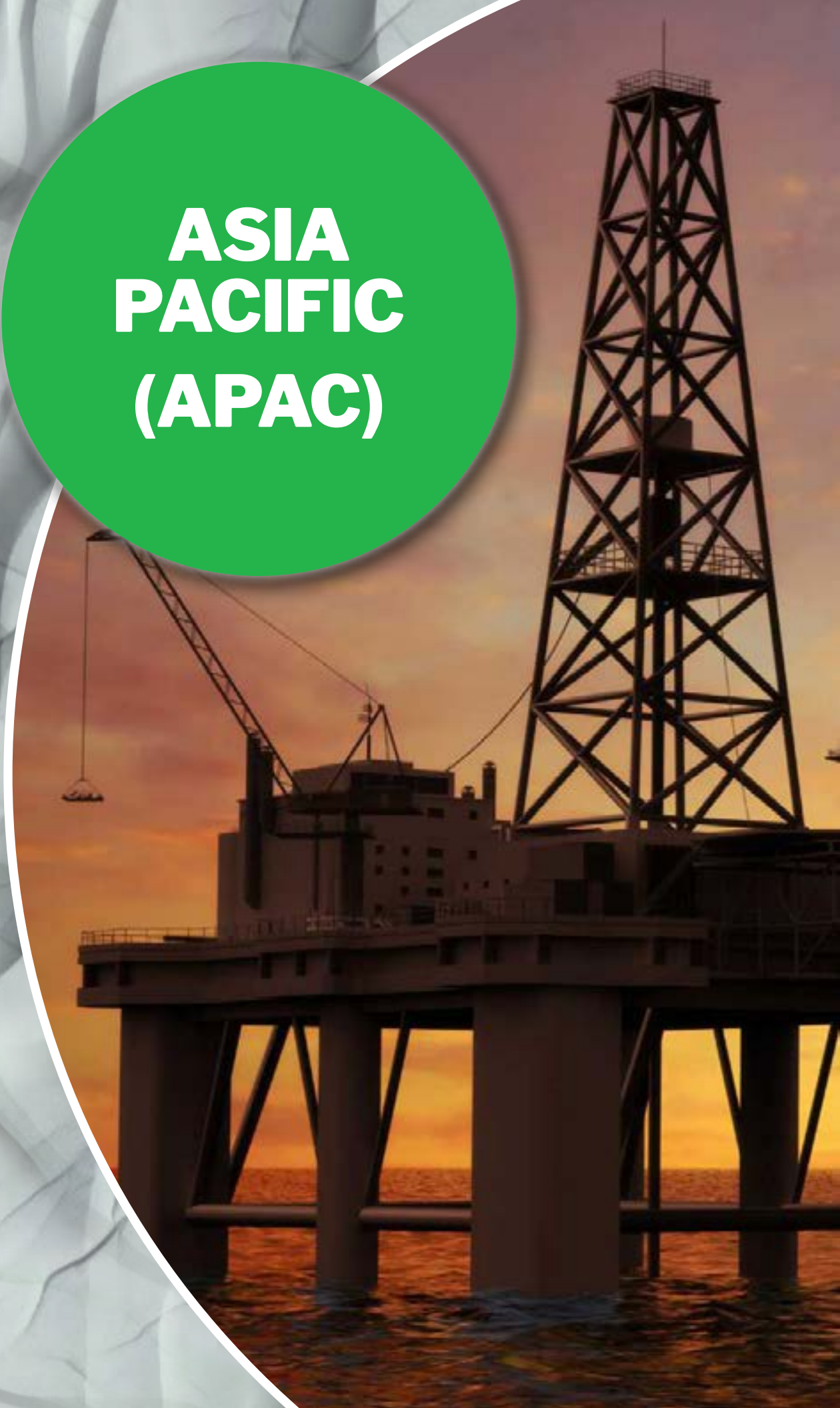
A History of Innovation.
Unrivaled Experience.
Global Presence.

Table of Contents

Interactive Navigation:

Click on each Region Section line in the Table of Contents (TOC) to go directly to that section or click the region acronyms in the green boxes in the navigation footer below and on each page . To navigate back to the Table of Contents, click anywhere in the TOC gray bar at the bottom of each page or on the TOC icon to the left of the navigation footer.

ASIA PACIFIC (APAC)



Malaysia

Successfully Completed Deep Water Casing Window Exit In a Single Trip Inside a 9⅝ in OD Liner

TrackMaster® CH Whipstock System provided an exit at 13,340 ft, 83° inclination, 532 m inside 9⅝ in. OD liner for a customer in Malaysia

Single Trip 9-5/8 in Liner Casing Exit with Detailed Job Planning

The customer in Malaysia required a sidetrack well to be executed inside a 9⅝ in liner at a nearly horizontal section. This complex operation was successfully planned and carried out on short notice. To address challenges such as the liner at the exit point and the 83° inclination, the Wellbore Integrity Solutions' (WIS) team led the effort, working closely with the customer to develop detailed procedures, select the optimal system configuration, and complete the exit at 13,340 ft with a maximum dogleg severity (DLS) of 3.92°/100 ft.

TrackMaster CH System

- An 8½ in OD Fast Track tri-mill was utilized to mill the casing window in a single trip, with the TrackMaster CH whipstock system facilitating the window creation in a near-horizontal section.
- A simplified design incorporating the reliable 9⅝ in TrackMaster Select System, along with a DPS hydraulic and tri-mill assembly, was selected for this deep-water application.
- The extensive operational experience of WIS personnel played a crucial role in successfully setting the whipstock along a challenging trajectory.
- As a result, the TrackMaster system milled a 9⅝ in liner exit in deep water with a 45° left-hand side (LHS) tool face orientation and drilled a rat hole in a single trip, enabling continued drilling of the 8½ in x 9⅞ in well section.

CHALLENGE

- Run the whipstock through the 9⅝ in OD liner
- Mill a window inside the 9⅝ in OD liner (53.5 PPF L80) at an 82.7° inclination, with a maximum dogleg severity (DLS) of 3.92°/100 ft
- Overcome challenges in swarf recovery and hole cleaning within the 9⅝ in OD liner, 13⅝ in OD casing, and a long section of riser for a deep-water well

SOLUTION

- Performed torque and buckling simulations using Runner software
- Conducted wellbore departure simulations with WhipSim™ to predict window geometry, rat hole trajectory, and the dogleg severity (DLS) of the bottom hole assembly (BHA) passing through the window; analyzed forces and stresses acting on the BHA and casing at the window
- Enhanced the milling BHA design by integrating a string magnet for optimized performance

RESULT

- Milled a clean window in 4.5 hours and drilled a 15 ft rat hole in 45 minutes in one trip
- Established a benchmark performance for a 9⅝ in liner exit at 10,383 ft window with 83° inclination in the region and operations

Malaysia

World's First Low-Side 13⅜-inch x 26-inch Dual Casing Exit Using TrackMaster Select™ Whipstock Saves $4 Million in Slot Recovery

Whipstock system achieves shallow-depth, low-side exit without cement support—paving the way for efficient, cost-effective sidetracks in complex conditions

Innovation in Dual Casing Exits Sets a New Industry Standard

The success of this operation marks a breakthrough in dual-casing sidetracks, demonstrating the ability to execute precision-engineered well departures in structurally complex environments. The 13⅜-inch (68 ppf, L80) × 26-inch (186 ppf, A36) dual-casing sidetrack, with the whipstock oriented to the low side (114° gravity tool face at 14° inclination), not only enabled recovery of a previously inaccessible well slot but also set a precedent for future late-life asset recovery strategies.

Wellbore Integrity Solutions (WIS) TrackMaster Select whipstock system played a pivotal role in this achievement, enabling operators to sidetrack with exceptional precision, control, and flexibility in orientation, setting, and milling—even in complex scenarios. This capability made it possible to execute the exit at a shallow depth, without cement support, and in a low-side configuration. The close collaboration between WIS and the Operator ensured thorough planning and successful execution of the sidetrack.

By working closely with the operator to tailor a sidetracking approach that met stringent operational demands, WIS reinforced its commitment to innovation and problem-solving in wellbore departure operations. This collaboration highlights the robustness and reliability of WIS' engineered solutions. The operation now serves as a reference point for future applications, demonstrating that slot recovery and sidetrack operations in low-side dual-casing environments can be executed efficiently, safely, and cost-effectively.

The TrackMaster Select whipstock system continues to set new standards in operational efficiency, cost reduction, and successful wellbore departure, providing oil and gas operators with a trusted solution for complex sidetrack challenges.

1st Run

2nd Run

The first run's tri-mill showed expected wear from milling through two casings and an additional 7-meter rathole. The second run exhibited minimal wear while polishing the milled window.

CHALLENGE

Sidetracking inside a 26-inch conductor casing at 144 meter depth posed challenges, including no commercial system and the need for a lower window opening. Conventional methods were unfeasible, requiring a precision-engineered whipstock for a stable wellbore exit.

SOLUTION

- Deployed a dummy 13⅜-inch casing without centralizers inside the 26-inch conductor to create gravity-assisted eccentricity, minimizing the annular gap
- Used a custom sidetracking approach with a low-side oriented 13⅜ in. TrackMaster Select WhipstocK for efficient dual-casing milling and rathole drilling
- Executed a two-trip strategy for optimal performance:
  — Trip 1: milled a precise, full-gauge window using a custom parameters roadmap
  — Trip 2: conducted a cleanout run for smooth 12¼ in. directional motor BHA passage

RESULT

- Set the 13⅜-inch whipstock low-side, milled the dual casing window (13⅜ inch × 26 inch), and drilled a 7 m rathole in one trip
- Ensured flawless 12¼-inch motor BHA passage for uninterrupted drilling to TD
- Delivered a full-gauge window, allowing smooth 9⅝-inch casing installation
- Exceeded customer expectations, optimizing efficiency and enabling well reentry
- Achieved over $4 million in savings

Kazakhstan

Successful Execution of the First ProMILL™ Milling and Underreaming Job in Central Asia

Successful deployment of the 5500 ProMILL for high-grade section milling and outer casing ID scraping in one trip

Cost-Efficient, Single-Trip Solution

A key customer in Kazakhstan required a cost-effective and robust solution to section mill high-grade, H_2S-resistant 7 in casing while also scraping the inner diameter (ID) of the outer 9⅝ in casing. The objective was to achieve a minimum of 16 m of milled and scraped interval to accommodate a bridge plug, along with sufficient lengths of bismuth and cement plugs.

Wellbore Integrity Solutions proposed the ProMILL® system, a trip-saving solution integrating the 5500 K-Mill™, featuring knives equipped with advanced TruEdge™ insert technology, and the 5500 high-ratio underreamer (HRU) with specially designed PDC-inserted scraper blocks.

Comprehensive Pre-Job Preparation

All tools were sourced, inspected, and function/pressure tested to ensure reliability. Knives, cutters' sweeps, and other critical parameters were verified for optimal compatibility with the job requirements. Hydraulic analysis was conducted based on the provided milling fluid data to determine the optimal operating parameters for each stage of the ProMILL execution, including cut-out, milling, and HRU deployment.

Field Execution

During the milling phase, optimal parameters were established, enabling the successful milling of a 20.9 m section of high-strength casing at an average rate of penetration (ROP) of 0.31 m/hr. Following ball-drop activation of the HRU, the total milled and scraped interval reached 19.8 m, exceeding the customer's minimum requirement—all completed in a single trip.

The K-Mill knives exhibited only 16% wear, highlighting the exceptional durability of the proprietary TruEdge insert technology, even after 67.3 hours of continuous milling.

CHALLENGE

- Mill high-grade, H_2S-resistant 7 in 32 ppf casing (SM-90SSU) inside a 9⅝ in casing
- Mill through two couplings
- Use slightly under-gauged stabilizers to allow the BHA to pass through the upper 7 in 35 ppf casing with a smaller ID
- Achieve a minimum of 16 m milled and scraped interval in a single trip

SOLUTION

- Utilize the cost-effective ProMILL milling and scraping system to complete P&A objectives in a single trip
- Deploy TruEdge™ – inserted section mill knives to enhance durability, stabilization, and swarf quality
- Conduct comprehensive hydraulic analysis to determine optimal flow rates for efficient tool operation and improved swarf removal

RESULT

- Achieved 20.9 m of section milled window in a single trip, exceeding initial objectives
- TruEdge inserts performed exceptionally, producing easily removable swarf and exhibiting only 16% knife wear
- Completed the job with zero NPT and no HSE-related incidents

WIS-FS-MKT-270_rev3

Safety and Environmental Stewardship.
We are committed to safe operations and sustainable impact.

EUROPE/ SUB-SAHARA AFRICA (ESSA)

Algeria

Record-Breaking Section Milling in a Single Run with K-Mill™ Milling Tool and TruEdge™ Cutter Inserts

Efficient 88.5 meter (290 ft) section milled in record time using 11700 Series K-Mill tool with TruEdge inserts during a sustained casing pressure related P&A operation

Innovation in Dual Casing Exits Sets a New Industry Standard

As part of a plug and abandonment (P&A) operation for a major customer in Algeria, the Wellbore Integrity Solutions team successfully milled an 88.5 meter window in 13⅜ inch 68 lb/ft L80 casing—setting a global single-run record for this casing size and weight.

The operation, which required an extended length plug in poorly cemented casing, demanded precise planning and execution. Key challenges included poor cement behind casing, swarf management, high-pressure zones, and the extended milling length. Success was driven by the robust 11700 Series K-Mill milling tool with TruEdge™ cutter inserts, an optimized BHA, hydraulic modeling, and a detailed parameter roadmap.

Post-run analysis confirmed tool performance met expectations, enabling the customer to proceed with the P&A program.

K-Mill tool, and TruEdge inserts after POOH during milling operation.

CHALLENGE

Section mill an extended length window in a 13⅜ inch 68 lb/ft L80 casing for a P&A operation of a well presenting sustained casing pressure issues.

SOLUTION

- Used the 11700 Series K-Mill with TruEdge inserts
- Performed hydraulic analysis with |HART simulation software to optimize cut-out and milling
- Ensured effective hole cleaning and tool performance
- Followed a detailed operational parameters roadmap for planning and execution

RESULT

- Successfully section milled a 88.5 meters (290 ft) window in a single run setting a global record in terms of footage milled
- Enabled subsequent abandonment and remedial operations

WIS-FS-MKT-279_rev4

North Sea

TrackMaster Select™ Thru-Tubing Casing Exits in the North Sea Deliver Low DLS Windows

Window and rathole created in single trip each time

Casing Exits Required for Sidetracking Through Tubing

An operator required a window to be milled through 5½-inch, 17 lbm/ft, L80 liner in each of two deviated wells in the North Sea to enable thru-tubing (TT) sidetracking. The dogleg severity (DLS) across each window needed to remain low enough to preserve the fatigue life of the 2⅞-inch tubing workstring. Additionally, each window was to be completed in a single trip.

TrackMaster™ Select TT Whipstock System Deployed with FasTrack Mill

The TrackMaster Select TT whipstock system is designed to pass through the tubing ID and, once below the tubing string, can be hydraulically anchored inside the liner to enable window milling operations. In this deployment, a 5½-inch whipstock and a FasTrack one-trip mill were used to create an extended-gauge window and drill the rathole in a single run.

Each exit created in single trip with subsequent trouble-free sidetracking:

- A 9.6 ft window was milled at 10,519 ft in 1½ hours and a 24-ft rathole was drilled and reamed in 3 hours on the first well, which had a 22° inclination. The window orientation was 48.5° to the left of the high side.
- On the second well, with a 52.5° inclination, a 9.6 ft window was milled at 11,729 ft in 2½ hours and a 16-ft rathole was drilled and reamed in 3½ hours. The window orientation was 47° to the left of the high side.
- Two notable successful thru-tubing casing exits were accomplished in a single trip each.
- The workstring performance was not compromised. Subsequent directional and completion assemblies passed through the window without difficulty.

CHALLENGE

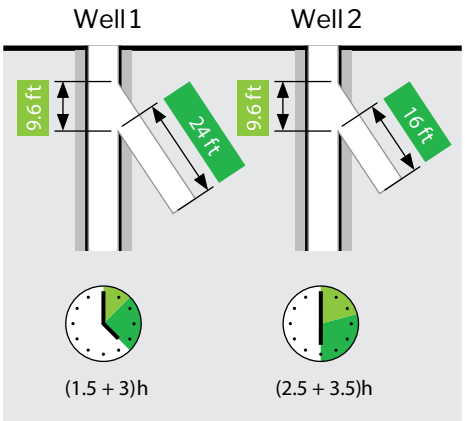
Mill a window through 5½-inch, 17 lbm/ft liner and drill a suitable rathole to enable deployment of a thru-tubing directional drilling assembly in each of two deviated wells.

SOLUTION

- Run 5½-inch TrackMaster Select TT thru-tubing whipstock system
- Use FasTrack one-trip mill
- Create extended-gauge windows
- Drill corresponding ratholes

RESULT

Completed two thru-tubing casing exits—each in a single trip—and deployed directional and completion assemblies through both



WIS-PB-MKT-280_rev3

wellboreintegrity.com

Wellbore Integrity SOLUTIONS

North Sea

First North Sea One-Trip, Dual-String Exit for Thru-Tubing Sidetrack

Full-gauge, window and 9½-ft rathole completed in eight hours

Sidetrack Planned Through Production Tubing and Liner

An operator decided to sidetrack a mature well in the North Sea to access additional reserves. Thru-tubing rotary drilling (TTRD) technology was selected as a cost-effective alternative to pulling the completion tubing. A Thru-tubing whipstock system was required to create the exit through 4½-inch, 12.6-lbm/ft tubing cemented inside 7-inch, 29 lbm/ft liner. The window had to enable a 3.7 inch × 4⅛ inch bicenter bit to be run on a 3⅛-inch OD directional assembly with a positive displacement motor (PDM) set at 1.8° bend angle.

TrackMaster™ TT Whipstock System and Bi-Mill Used to Create Exit

4½ inch TrackMaster thru-tubing (TT) whipstock system, with an OD of 3.62 inch, is designed to pass through the tubing ID. Running in with the whipstock, orienting and setting it, shearing the milling assembly from the whipstock, milling the window, and drilling the rathole can all be accomplished in a single trip. A 3.8-inch OD bi-mill was used to create the window. The TrackMaster TT whipstock system enables a longer casing window to facilitate subsequent entry of drilling assemblies.

First North Sea Dual-String Exit Accomplished in Single Trip

After milling a full-gauge in 1½ hr, a 9½-ft rathole was drilled in 6½ hr. This enabled the sidetracking BHA to enter the rathole and drill a 9,200 ft sidetrack with an inclination of 20.67°. This operation marked North Sea's first successful one-trip, dual-string exit through production tubing.

TrackMaster Thru-Tubing whipstock system completed North Sea's first one-trip, dual-string exit though production casing in a single trip.

CHALLENGE

Mill a full-gauge window through 4½-inch tubing and 7-inch liner, and drill a rathole to allow entry of a directional sidetracking assembly.

SOLUTION

Run the 4½-inch TrackMaster thru-tubing whipstock system and 3.8-inch OD bi-mill.

RESULT

Completed the window and 9.5-ft rathole in 8 hr marked – North Sea's first successful one-trip dual-string exit through production tubing.

WIS-PB-MKT-283_rev3

Norway

Innovative TrackMaster™ Thru-Tubing Whipstock Contributes to Successful Offshore Casing Exit

Full-gauge, window and 1.9-meter rathole completed in 4½ hours

Specialized Solution to Achieve a Complex Objective

A Norwegian operator faced two key technical challenges during a planned through tubing rotary drilling (TTRD) casing exit on an offshore well. The operation demanded precise execution and specialized equipment.

The first challenge was milling a window in a 5 inch, 15 ppf 13% chromium (13Cr) liner. The corrosion-resistant material required accurate milling to create a clean exit path for a directional assembly capable of a 45°/100 feet build rate—an aggressive turn needing a compact, high-performance bottomhole assembly.

The second challenge involved maintaining production from the motherbore after drilling the lateral. Unlike typical whipstock setups that block flow, this operation required equipment that could enable production while leaving the whipstock in place to allow for future re-entry into the lateral. This introduced tight constraints on completion and junction design, requiring a balanced solution that ensured flow access, structural integrity, and re-entry capability.

These combined challenges highlighted the complexity of the project and demanded innovative drilling and completion strategies.

Project Information	
Depth	3,024 m
Inclination	21.7°
Liner	5 inch – 15ppf 13% Cr
Whipstock	4 inch OD TrackMaster TT
Milling Tool	4.2 inch OD FasTrack Bi-Mill
Work String	2⅞ inch OD XTM 26

CHALLENGE

- Mill a window in a 5 inch, 15 ppf 13% Cr liner
- Enable deployment of a directional assembly capable of a 45°/100 ft build rate
- Identify equipment that allows continued production from the motherbore after lateral drilling
- Whipstock had to remain in place to support potential future re-entry into the lateral

SOLUTION

- Trackmaster™ thru-tubing whipstock and FastTrack window milling system to achieve their objectives
- The back of the whipstock was fluted to provide additional flow area
- PDC inserts were used over 30% of bi-mill cutting structure

RESULT

- 1.7 meters of window milled in 3½ hours
- 1.9 meters of rat hole drilled in 1 hour
- Subsequent run to dress the window ensured a full gauge, usable exit
- 3.8° AKO motor with 4 inch Smith M09 bit drilling assembly deployed through the exit
- Customer completed window in the allocated time

Spain

Single-Trip Section Milling of 200 ft in 13⅜-inch Casing Using Hydraulic Workover Unit

Successfully milled a 13⅜-inch casing on a challenging well, with a hydraulic workover unit for a customer in Spain.

Optimized Section Milling BHA from a Hydraulic Workover Unit

As part of an ongoing plug and abandonment (P&A) campaign in the offshore sector of Spain for a key customer, a 200-foot section of 13⅜-inch, 72 lb/ft casing was milled to enable placement of a reservoir isolation barrier.

This marked the seventh section milling operation on the same installation. Drawing on lessons learned from previous campaigns under more challenging conditions, WIS' Fishing Specialists designed an optimized bottomhole assembly (BHA) onsite. This approach significantly reduced the risks typically associated with section milling from a hydraulic workover unit (HWU).

This marked the seventh section milling operation on the same installation. Drawing on lessons learned from previous campaigns under more challenging conditions, Fishing Specialists designed an optimized bottomhole assembly onsite. This approach significantly reduced the risks typically associated with section milling from a HWU.

A 11700 section mill equipped with TruEdge™ milling inserts was selected and paired with a low-speed, high-torque motor to maximize efficiency and reliability.

Given the complex downhole conditions, a carefully controlled milling strategy was adopted. This enabled effective coordination of HWU support systems, milling performance, mud properties, and hole cleaning operations. To enhance hole cleaning, surface rotation of the string was maintained at low RPM.

The strategy resulted in successful milling of a 200-foot window in the 13⅜-inch casing in a single trip. Post-operation inspection revealed only 40% wear on the section mill knives.

CHALLENGE

- Mill 13⅜-inch casing on a challenging well, from a hydraulic workover unit

SOLUTION

- 13⅜-inch section milling BHA was optimized for milling and circulating
- Controlled parameters—balancing milling rate of penetration, hole cleaning and motor operation
- Specialized high–torque downhole motor (8 inch OD)
- TruEdge milling insert technology

RESULT

- Successfully milled a 200-foot window in 13⅜-inch 72 lb/ft casing in a single trip
- Milled through three casing couplings without issue
- TruEdge milling insert technology showed only 40% knife wear post-operation
- Operation completed with zero non-productive time (NPT) and no HSE incidents

WIS-FS-MKT-287_r4

LATIN AMERICA (LAM)

Ecuador

Ecuador's Successful Critical Fishing Operation: Retrieving a Seal Bore Packer and Gravel Pack in a Single Run

Careful planning and detailed risk analysis led to the successful retrieval of a Seal Bore Quantum Packer along with a 159-ft gravel pack completion in a single run at a remote location

Precise Torque and Drag Simulation Execute an Outstanding Operation

Precise Torque & Drag simulations were key to executing this outstanding operation. The well was assigned to Wellbore Integrity Solutions (WIS) due to its proven expertise in retrieving Quantum Packer Seal Bore systems. The challenge: remove both the packer and the gravel pack completion—159 ft long—in one run.

Effective communication between companies helped identify the weakest component of the completion. Based on torque and drag simulations, working limits were set to minimize the risk of breaking the safety shear sub. Runner simulations provided accurate outputs for pulling force, impact force, and weight transmission.

The operation required a gradual pull of 24 klbs to deactivate the seal bore setting mechanism and 34 klbs to lift the gravel pack completion. Extensive planning ensured efficiency and delivered significant cost savings.

Cost-Saving Opportunity

Completing the retrieval in a single run avoided additional BHAs, milling strategies, and external/internal fishing options. Detailed analysis and flawless execution exceeded expectations, reducing trips and optimizing the intervention plan for the customer.

WELL INFORMATION

Casing Size: 7 in. (P-110, 26 lbs/ft)
Depth: 6,735 ft. @ 13.72° inclination

CHALLENGE

Retrieve a sand control completion with screens inside a 7-in, 26# casing. Total fish length: 159 ft.

SOLUTION

WIS conducted a detailed analysis of pulling limits and impact forces using TMC impact tools to transmit optimal pulling force. The pull had to be strong enough to disengage the seal bore packer yet controlled to prevent breaking the safety shear sub.

RESULT

- The entire fish was retrieved without issues
- Fewer BHAs and optimized intervention plan
- Integrated solution delivering significant cost savings
- Outstanding planning and engineering analysis

Colombia

TrackMaster Select™ Thru-Tubing Operation Achieves Record-Breaking Window Milling with Coiled Tubing

Coiled tubing limitations — utilized 2-inch coiled tubing at extreme depths with challenging hydraulics and weight control

Challenging Operation in Deep Hard Formation Sandstone

The TrackMaster Select™ TT whipstock system enables cost-effective sidetracking by eliminating the need to pull completion tubing. Designed to pass through the tubing ID, it orients and hydraulically anchors inside the liner for window milling, with a unique geometry that compensates for casing size variations.

In a Colombian pilot coiled tubing drilling (CTD) project, a customer sought to re-enter wells in the Cupiagua and Cusiana fields while maximizing existing equipment. This required executing casing exits at unprecedented depths using 2-inch coiled tubing in 5½ inch × 5 inch completions, posing hydraulic and weight control challenges. The 25,000 psi sandstone further demanded a window mill capable of both casing milling and rock drilling.

Partnering with Wellbore Integrity Solutions' Red Baron® team, the project successfully completed five casing exits, setting new depth records for coiled tubing milling. The system's specially engineered PDC cutters enabled efficient casing milling and high-strength rock drilling, ensuring project success.

TrackMaster Select TT Project Information

Casing	Liner	Coil Tubing	Milling Tool	Formation
5½ in 23#	5 in - 18ppf, L-80, 13% Cr	2 in HS110	Geotrack Window Mill	Sandstone

Whipstock	Top of Whipstock	Inclination	Successful Window
#1	14,901 ft	4°	Yes
#2	15,807 ft	36°	Yes
#3	15,773 ft	35°	Yes
#4	15,740 ft	33°	Yes
#5	15,760 ft	33°	Yes

CHALLENGE

Execute record-depth casing exits in ultra-hard sandstone using limited existing equipment and 2-inch coiled tubing, despite hydraulic, weight control, and milling constraints.

SOLUTION

- **Maximized Existing Equipment:** Required utilizing as much existing equipment as possible, adding technical constraints
- **Coiled Tubing Limitations:** Utilize 2.0-inch coiled tubing, setting the whipstock in 5½-inch casing passing via 5-inch ID liner; additionally deal with challenging hydraulics and weight control
- **Deepest Coil Tubing Exits:** Proposed exits were deeper than any previously attempted with coiled tubing
- **High-Strength Sandstone:** Formation had a compressive strength of 25,000 psi, requiring a window mill capable of milling casing and drilling through hard rock

RESULT

- Successfully re-entered the wells in the Cupiagua and Cusiana fields as part of a pilot CTD project
- Red Baron team provided advanced window milling technology to execute the casing exits
- Five casing exits were successfully completed, significantly contributing to project goals
- Utilized a milling structure with specially formulated PDC cutters designed to mill casing and drill through high-compressive-strength rock

WIS-PB-MKT-271_rev4

Mexico

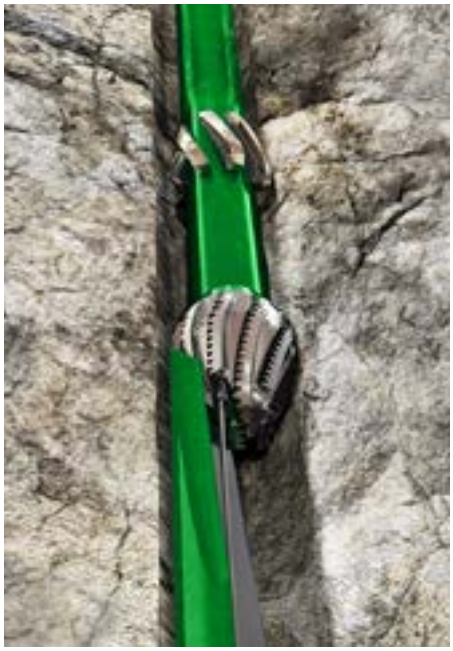
Mexico's Deepest OH Sidetrack Achieved with 7-inch TrackMaster Select™ Whipstock System

Successfully planned and executed an open hole sidetrack at 7,789 meters (25,554 ft) in a high unconfined compressive strength (UCS) formation

Identifying and Managing Risk to Deliver Exceptional Results

Wellbore Integrity Solutions (WIS) collaborated with a major oil and gas operator in Mexico to execute the deepest registered sidetrack operation in the country. The team deployed a 7-inch TrackMaster Select™ whipstock system, customized with a hard-formation bi-mill and an expandable anchor for use in an open-hole section. WIS developed a detailed plan and execution strategy tailored to the deep-well conditions, addressing challenges related to high temperature and pressure.

Despite issues with the orientation tool caused by elevated temperatures, the 7-inch whipstock was successfully set at 7,798 meters. Milling proceeded smoothly and consistently, producing a high-quality window in the high unconfined compressive strength (UCS) formation. The window was milled from 7,789 to 7,792.2 meters with precise control of parameters to meet customer expectations. A short rathole length of 0.4 meters was intentionally planned to protect the mill from high torque. Subsequently, the next bottomhole assembly (BHA) with a bit was run to drill an additional 47 meters, extending the rathole for rotary steerable system (RSS) pass-through. This achievement reinforces WIS's reputation as a trusted partner in complex deep-well sidetrack operations.



Setting OH Section: 7 inch, high UCS
Setting Depth: 7798 m @ 0.24°/30 m
Inclination @ Whipstock: 3.6°

CHALLENGE

- Deploy a 7 inch TrackMaster Select whipstock system to perform the deepest OH sidetrack operation in Mexico at 7,789 meters
- High unconfined compressibility strength (UCS) 17-27 and abrasive formation type
- Window must provide low pass-through DLS for subsequent drilling BHA's

SOLUTION

- Recommended and deployed the TrackMaster Select Fastrack system configured with 5⅝ inch OD bi-mill and a hydraulic expandable anchor

RESULT

- Delivered a high-quality window for smooth passage of subsequent directional BHA and completion string
- 5⅝ inch OD bi-mill dull grade remained within acceptable gauge loss criteria
- A 3.2 meter long window was drilled along with 0.4 meter rathole.

Wellbore Integrity SOLUTIONS

Ecuador

Ecuador Achieves Successful Cased Hole Sand Cleanout and Well Stimulation in a Single Run

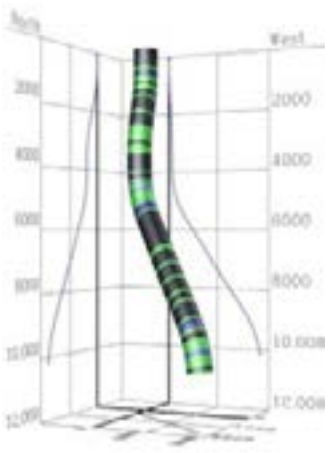
First use of a 4⅝-inch sand bailer and 6 inch junk mill to clean sand from a 7-inch casing and perform biocide well stimulation in a single workover run

A Wellbore Sand Clean out Challenge in Ecuador

A major oil and gas operator, in collaboration with Ecuador's Wellbore Integrity Solutions team, planned a new workover approach combining sand clean out and well stimulation operations. The well required the removal of a 25 ft interval of resin and sand mixture inside 7-inch casing. The clean out was performed using a 4⅝-inch OD sand bailer tool, featuring a 15 ft stroke that creates a suction effect of 9 gallons per stroke. As the tool is actuated, the material is drawn into the chamber and retained by a flapper valve. A drain sub was installed above the sand bailer, providing annular communication to pump a biocide sweep for well stimulation. The operation was executed efficiently thanks to thorough planning, resulting in significant cost savings.

Integrated Solutions and Advanced Technology

The sand bailer system's competitive advantage over similar local tools lies in its rotary connection, which enables the BHA to rotate, clear obstacles, and retrieve resin and sand from the wellbore. This capability allowed for an integrated approach, saving the customer up to one trip by combining sand clean out and well stimulation. Technology selection and BHA optimization were key customer priorities, and Wellbore Integrity Solutions' engineering team delivered the optimal solution to meet their objectives.



Left: Well trajectory
Center: Junk mill 6 inch OD full bore with gauge ring
Right: Sand bailer system mandrel

Casing Size: 7 inch (P-110, 26 lbs/ft)
Setting Depth: 10,488 ft @ 1.82 (°/100 ft)

CHALLENGE

The customer required to clean out 25 ft mixture of resin and sand inside the 7-inch casing, prior to performing well stimulation operation to assure and maintain suitable productivity level.

SOLUTION

Recommended and deployed a wellbore sand clean out technology.

- A 4⅝-inch sand bailer with a 15-inch stroke to retrieve material into the chamber
- A 6-inch OD junk mill to remove remaining resin and sand

RESULT

- A successful execution that exceeded customer expectations, optimizing the number of BHAs intended
- Integrated solution approach functioned as intended
- First outstanding run of this BHA combination in the Ecuadorian oilfield

WIS-FS-MKT-281_rev1

Mexico

Successful Cased Hole Fishing Operation Recovers 4,000 meters of 3½-inch Drill Pipe and Bottom Hole Assembly

Operations team retrieves 5⅝-inch OD drilling BHA after twist-off failure in 3½-inch drill pipe

Carefully Planned Fishing Operation Reduces Cost and Saves Time

Wellbore Integrity Solutions' Red Baron® team in Mexico supported a major oil and gas operator in achieving a key milestone: the successful retrieval of 4,000 meters of drill pipe and the bottomhole assembly (BHA) left in the well.

The operation was carefully planned based on evidence of a twisted-off drill pipe joint, which showed deformation at its lower end—indicating a challenging top of fish. To mitigate this, a contingency junk mill run was prepared in case the top of fish was too damaged to engage with the overshot.

The objective was to complete the recovery with minimal runs and within a short timeframe. This was achieved in just two days with a single run of the fishing BHA.

Fishing BHA Configuration

- 8⅛-inch oversize guide
- 5¾-inch overshot dressed with a 3⅜-inch basket grapple
- 5¾-inch overshot extension

The drill string was located in a 5⅝-inch open hole section, with the 3½-inch drill pipe inside 7-inch casing, extending up to the 9⅞-inch casing. This configuration presented challenges due to the smaller outer diameter (OD) of the fish relative to the larger casing ID, as well as limited jarring capability caused by the long distance between the overshot and total fish depth

Successful recovery was confirmed by a 125-ton increase in weight while pulling out of hole, indicating that 100% of the fish had been brought to surface—without the need to activate the jars.

Casing Size: 7 inch x 9⅞ inch
Fish Total Depth: 6,594 m
Top of Fish Depth: 2,630 m

CHALLENGE

Retrieve the drilling BHA and drill pipe left in hole. The total length of the fish was 4,000 meters, requiring a meticulously planned operation to recover the entire assembly in a single overshot run. The top of the fish was deformed due to a twist-off in the drill pipe. The objective was to minimize the number of operational runs and reduce overall recovery time.

SOLUTION

Recommended and deployed a 5¾-inch overshot with an 8⅛-inch oversize guide, integrated with a 3⅜-inch basket grapple and 3½-inch mill control, enabling secure engagement with the fish and the ability to work the string if necessary

RESULT

- Successfully latched onto the fish and retrieved 4,000 meters of drill pipe and BHA in a single run, exceeding customer expectations
- 100% of the fish was recovered as planned
- Marked the longest fish retrieval in Mexico operations

WIS-FS-MKT-285_r1

Ecuador

Critical Cased Hole Fishing Recovers 2,300-ft of Wire and Electrical Submersible Pump (ESP) BHA

4-inch OD artificial lift bottomhole assembly (BHA) successfully recovered after being left in the wellbore due to a workover deviation

Unplanned Fishing Operation Achieves Full Recovery, Avoiding Well Abandonment

The Red Baron® team in Ecuador supported a major oil and gas operator in achieving a significant milestone: the successful retrieval of an artificial lift ESP bottomhole assembly (BHA) and 2,300 feet of electrical wire left in the wellbore.

A Following an unexpected deviation in the workover plan that resulted in the ESP BHA being left in hole, the team was urgently mobilized along with fishing tools and experienced personnel. Based on the evidence and the volume of wire to be recovered, a targeted fishing plan was developed. A complete set of wireline spears was deployed, with the heavy-duty center prong and crankshaft delivering the best results:

- The center prong retrieved an average of 167 feet of wire per run, with a maximum of 340 feet.
- The crankshaft retrieved an average of 324 feet per run, with a best run of 528 feet.

The operation aimed to minimize the number of runs and complete the recovery within a short timeframe—an objective that was successfully met. The fishing BHA was equipped with:

- 8⅛-inch overshot
- 8⅛-inch overshot upper extension
- 8⅛-inch washover rotary shoe
- 4-inch basket grapple

The ESP BHA was located inside 9⅝-inch casing, above the 7-inch liner hanger at a depth of 10,523 feet. The fishing operation was particularly challenging due to the presence of electrical wire and the unknown condition of the BHA. Jarring was limited to the weakest latching point—the EUE coupling.

Recovery was confirmed by a 6,000-pound increase in pull weight while retrieving the assembly, resulting in 100% of the fish being brought to surface.

Casing Size: 9⅝ inch (53.5# - N80)
Top of Fish Depth: 10,380 ft
Fish Total Depth: 10,523 ft

CHALLENGE

- Execute a 9⅝-inch cased hole fishing operation to retrieve a 142-foot ESP bottomhole assembly (BHA) and 2,300 feet of electrical wire
- Achieve full recovery in minimal runs to restore the workover intervention and minimize non-productive time

SOLUTION

- A set of heavy-duty wireline rope spears (crankshaft and center prong) was deployed, along with an 8⅛-inch overshot FS integrated with a 4-inch basket grapple and a 4½-inch mill control
- This configuration enabled efficient retrieval of the electrical wire prior to successfully latching and recovering the ESP BHA

RESULT

- Successfully latched onto the ESP BHA in a single run after recovering 2,300 feet of electrical wire, exceeding customer expectations
- Achieved 100% fish recovery as planned
- The variety and quality of tools enabled flawless execution of the operation

WIS-FS-MKT-292_rev1

Mexico

Successful Window Milling in 7 inch x 9⅝-inch Casing Using 5⅝-inch FasTrack™ Hybrid Bi-Mill in Mexico

Expert planning and hybrid bi-mill technology deliver a smooth, precise window in a Mexico sidetrack

Careful Planning Leads to Successful Dual Casing Sidetrack Operation in Mexico

Wellbore Integrity Solutions' Mexico team supported a major oil and gas operator in achieving a significant milestone: completing their first dual casing exit through 7-inch TAC-140 and 9⅝-inch TAC-110 casing at a depth of 5,898 meters (19,350 feet).

The operation utilized a 7-inch TrackMaster Select™ whipstock and a 5⅝-inch OD hybrid bi-mill, which delivered a high-quality, full-gauge window in just four milling stages. Both the 3.21-meter window and 3.6-meter rathole were completed on schedule.

Dual casing exits are particularly challenging in high-strength casing environments such as TAC-110 and TAC-140. To meet the operator's goals for depth and cost-efficiency, the team engineered a sidetrack solution that accounted for extreme conditions—including fatigue risks from combined stresses on the bi-mill during window milling and rathole drilling through high unconfined compressive strength (UCS) formations.

The 7-inch whipstock was successfully set at 5,904 meters with a 66° right-hand side (RHS) orientation. Following completion of the window and rathole, a bottomhole assembly (BHA) with a 5⅝-inch OD bit and 5⅝-inch OD watermelon mill was run to extend the rathole and ensure sufficient length for the rotary steerable system (RSS) to pass through.

Casing Size: 7 inch (TAC-140, 38 lbs/ft) & 9⅝ inch (TAC-110, 53.5 lbs/ft)
Setting Depth: 5,904 m @ 2.24°/30m
Inclination @ Whipstock: 34.7°

CHALLENGE

- Execute a dual casing sidetrack through 7-inch TAC-140 and 9⅝-inch TAC-110 casing
- Create a full-gauge, usable window at 5,898 meters, exiting into a formation with unconfined compressive strength (UCS) ranging from 17 to 27 KSI
- Design a whipstock system capable of staged milling to mitigate failure risks posed by high-strength casing

SOLUTION

- Deployed the TrackMaster Select™ whipstock system and FasTrack™ mill tool
- Configured with a 5⅝-inch OD hybrid bi-mill for dual casing window milling
- Utilized a hydraulic permanent anchor to ensure whipstock stability
- Equipped the lead mill with tungsten carbide and diamond inserts to enhance milling efficiency

RESULT

- Successfully completed staged milling of the window and rathole, exceeding customer expectations
- The 5⅝-inch OD hybrid bi-mill remained within acceptable dull grade and gauge loss limits, despite challenging casing and formation conditions

Ecuador

Successful 7-inch TrackMaster™ CH Whipstock System Deployment Despite Flow Rate Constraints

Successfully planned and executed a cased hole sidetrack application at 11,492 feet to deliver a smooth and optimal window

High-Performance Results: Achieving a Smooth, Full-Gauge Window in a Single Trip with the TrackMaster™ Cased Hole Whipstock System

The Ecuador team supported a major oil and gas operator in successfully completing a 7-inch P-110 casing exit at 11,466 ft—marking a key milestone in the project and reinforcing their role as a trusted partner in whipstock operations.

Using the 7-inch TrackMaster Select whipstock system configured with a 6 ⅛-inch OD tri-mill, the team achieved a high-quality, full-gauge window in a single milling stage. The operation included milling a 10½ ft window and drilling a 10 ft rathole, both completed on schedule.

The whipstock was precisely set at 11,487 ft with a 60° right-hand side (RHS) orientation. Milling progressed smoothly and consistently, producing a clean, high-quality window. Careful parameter control ensured alignment with customer expectations and minimized deviation.

The sidetrack was engineered to withstand combined stresses along the tri-mill body during milling. A detailed execution plan was developed to ensure tool reliability and performance throughout the operation.

Although MWD flow limitations led to reduced swarf recovery at surface—despite bottom-up circulation cycles—ditch magnets effectively captured metallic debris. This maintained well cleanliness and minimized the risk of metallic swarf being left in hole. Subsequent pass-through runs with motor and rotary steerable system (RSS) tools were successfully completed under optimal operating conditions.

Casing Size: 7 in (P-110, 29 lbs/ft)
Depth: 11,466 ft @ (1.33°/100 ft)

CHALLENGE

- Perform an optimal sidetrack through 7-inch P-110 casing, exiting at 11,492 ft into an 8 Ksi UCS formation
- Plan and execute the operation in a single run

SOLUTION

- Deployed the TrackMaster cased hole whipstock system and Fastrack milling tool, featuring a 6⅛-inch OD tri-mill and a hydraulic permanent anchor
- Run dummy BHA beforehand to confirm the wellbore section was clean, ensuring proper setting of the hydraulic anchor without complications

RESULT

- Successfully completed window and rathole milling in a single run, exceeding customer expectations
- 6⅛-inch OD tri-mill maintained acceptable gauge and dull grade within specified limits

Gulf of Mexico

TrackMaster Select™ Whipstock System Enables First 20 inch Low-Side Sidetrack in Gulf of Mexico

Successfully deployed the TrackMaster Select system to sidetrack from 20-inch, 133 lb/ft K-55 casing, enabling recovery of the 17½-inch hole section

Innovation in Dual Casing Exits Sets a New Industry Standard

The success of this operation marks a breakthrough in dual-casing sidetracks, demonstrating the ability to execute precision-engineered well departures in structurally complex environments. The 13⅜-inch (68 ppf, L80) × 26-inch (186 ppf, A36) dual-casing sidetrack, with the whipstock oriented to the low side (114° Gravity Tool Face at 14° inclination), not only enabled recovery of a previously inaccessible well slot but also set a precedent for future late-life asset recovery strategies.

The TrackMaster Select whipstock system played a pivotal role in this achievement, enabling operators to sidetrack with exceptional precision, control, and flexibility in orientation, setting, and milling—even in complex scenarios. This capability made it possible to execute the exit at a shallow depth, without cement support, and in a low-side configuration.

By working closely with the operator to tailor a sidetracking approach that met stringent operational demands, Wellbore Integrity Solutions reinforced its commitment to innovation and problem-solving in wellbore departure operations. This collaboration highlights the robustness and reliability of WIS engineered solutions. The operation now serves as a reference point for future applications, demonstrating that slot recovery and sidetrack operations in low-side dual-casing environments can be executed efficiently, safely, and cost-effectively.

The TrackMaster Select Whipstock system continues to set new standards in operational efficiency, cost reduction, and successful wellbore departure, providing oil and gas operators with a trusted solution for complex sidetrack challenges.

CHALLENGE

Sidetracking inside a 26-inch conductor casing at 144 meter depth posed challenges, including no commercial system and the need for a lower window opening. Conventional methods were unfeasible, requiring a precision-engineered whipstock for a stable wellbore exit.

SOLUTION

- Deployed a dummy 13⅜-inch casing without centralizers inside the 26-inch conductor to create gravity-assisted eccentricity, minimizing the annular gap
- Used a custom sidetracking approach with a low-side oriented 13⅜-inch TrackMaster Select whipstock system for efficient dual-casing milling and rathole drilling
- Executed a two-trip strategy for optimal performance:
  — Trip 1: milled a precise, full-gauge window using a custom parameters roadmap
  — Trip 2: conducted a cleanout run for smooth 12¼-inch directional motor BHA passage

RESULT

- Set the 13⅜-inch whipstock low-side, milled the dual casing window (13⅜ inch × 26 inch), and drilled a 7-meter rathole

Customer Focused. We create a culture that is focused on meeting and exceeding customer expectations.

MIDDLE EAST, NORTH AFRICA (MENA)

Middle East

A New Record of a 220-foot Window was Milled Using the K-Mill™ Section Milling Tool

An efficient well abandonment was successfully completed in a gas well using the 8200 Series K-Mill, section milling a 220 foot window in 9⅝ inch NKA casing (53.50 ppf)

Record-Setting Success for Longest Milled Window

The Wellbore Integrity Solutions team successfully section-milled a 220-foot window in 9 5/8-in. NKA casing (53.50 ppf), setting a national record for the longest window milled in this casing size and weight.

The success of the operation was driven by the robust and reliable design of the K-Mill tool, meticulous job planning, and the expertise of experienced personnel. Key technical challenges addressed included a vertical well, poor cement quality (as indicated by logs), heavy-duty casing, and an extended milling window. Execution incorporated a dedicated parameter roadmap, hydraulic simulations for both cut-out and milling, and an optimized BHA to enhance stabilization.

Section Milling Operation Summary

TOW	Footage Milled	Ave ROP	Number of Runs	Comments
10,030 ft	220 ft	2.2 ft/hr	2	First run footage: 175 ft Second run footage: 45 ft

Post-run evaluation confirmed that the tools remained within acceptance criteria. The 8200 Series K-Mill successfully milled the required window, allowing the customer to proceed with the well's plug-and-abandonment plan.

First and second run tools remained in good condition after successfully completing the section milling.

CHALLENGE

Section mill a 220-foot window in 9⅝-inch NKA casing (53.50 ppf) for a gas well abandonment operation within 13⅜-inch VMC parent casing (72 ppf).

SOLUTION

The K-Mill 8200 Series tool was deployed alongside hydraulic analysis using HART simulation software to optimize both the cut-out and milling operations, ensuring proper tool performance and effective hole cleaning. A detailed operational parameters roadmap was integral to the planning and execution process.

RESULT

- Successfully section milled a 220-ft window, setting a record in KSA
- The window was completed in two runs
- Enabled subsequent abandonment and remedial operations

WIS-FS-MKT-266_rev2

Middle East

ProMILL Duo™ Dual Casing Isolation Solution for a Complex Two Cap Rock Project

Ensured rock-to-rock barrier restoration for fluid pressure isolation in the annulus between dual casing strings

Complex Remediation for Dual-Casing Isolation

A customer in the Middle East engaged Wellbore Integrity Solutions to restore cap rock integrity in a complex deep land well. The objective was to isolate two cap rock formations located at depths of 8,240 ft and 5,500 ft.

The well experienced sustained annular pressure and hydrocarbon migration to the surface due to microchanneling caused by poor cement integrity between the 7 in, 29 ppf C-75 casing and the 9⅝ in, 47 ppf C-75 casing.

To mitigate these issues, Wellbore Integrity Solutions collaborated with the customer to develop a targeted remediation strategy involving dual-casing section milling across both cap rock intervals. Extensive pre-job planning was conducted to optimize milling depths, ensure effective swarf recovery, and maintain proper hole cleaning. Wellbore mud properties were adjusted to enhance debris removal while keeping standpipe pressure within operational limits.

For each dual-casing window, the milling sequence was executed as follows:

- **Inner Casing Milling** – The operation commenced with the 5500 K-Mill cutting and milling the 7 in casing.
- **Cement Removal and Casing Cleaning** – The 5500 ProMILL® underreamer was deployed to remove residual cement and clean the 9⅝ in casing ID.
- **Outer Casing Milling** – The 9⅝ in casing was then section milled as required.
- **Rock-to-Rock Barrier Restoration** – The ˜5500 ProMILL underreamer enlarged the cementation zone to 13.5 in in the open hole, exposing fresh formation to facilitate effective rock-to-rock bonding across both cap rocks.

Both dual-casing milling operations were successfully executed, restoring cap rock integrity and achieving the customer's permanent barrier isolation requirements at these critical geological depths.

CHALLENGE

Two rock-to-rock barrier restorations were required in the same well to prevent hydrocarbon migration. Cap rock isolation was needed at depths of 8,200 ft and 5,400 ft due to microchanneling caused by poor cement integrity across the casing annuli.

SOLUTION

- Deploy the 5500 K-Mill milling tool to initiate the cap rock restoration process
- Utilize the 5500 ProMILL® underreamer for precise underreaming and enhanced borehole conditioning
- Implement the 6000 ProMILL Duo™ to achieve rock-to-rock isolation of both cap rocks, ensuring a fully restored cap rock barrier

RESULT

- A dual-casing section milling operation was safely executed using a Kelly Rig.
- As a critical part of the well plug and abandonment plan, rock-to-rock barriers were effectively placed across both casing strings
- Successfully prevented hydrocarbon migration to the surface
- Ensured protection of the freshwater reservoir from contamination
- Eliminated the need for 112 days of conventional pilot milling from the surface

Middle East

TrackMaster® OH 7-inch Whipstock Sidetrack Cuts 2.7+ Days of Rig Time in Hard Formation

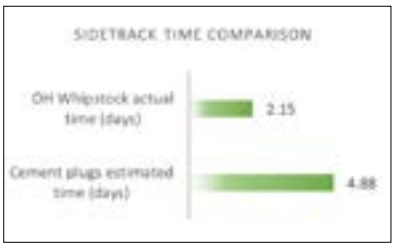
Precision sidetrack with TrackMaster OH places TOW 30-feet below 7-inch casing in tough reservoir for a customer in the Middle East

Optimized 5⅞-inch Open Hole Sidetrack with TrackMaster OH Enhances Efficiency and Reduces Costs in Hard, Abrasive Formation

After detailed reservoir logging analysis, a major operator in the Middle East sought a rapid and effective open-hole sidetrack solution just below the 7-inch casing shoe. A regular cement plug strategy would not be feasible because of the precision required for the kick-off point (KOP) and the hardness of the formation. The Wellbore Integrity Solutions' team worked closely with the operator to engineer an optimal sidetracking approach, overcoming the three critical technical challenges:

- Precisely positioned the top of whipstock (TOW) at 30-feet below the casing shoe, avoiding an area with an oversized hole while maintaining structural integrity above the abandoned original hole.
- Executed the sidetrack in a vertical well, ensuring an accurate exit trajectory with minimal tracking or deviation risks.
- Navigated extreme formation hardness and abrasiveness, where conventional motor and cement plug sidetracking methods often fail.

Leveraging expert planning and execution, the TrackMaster OH system successfully achieved a one-trip sidetrack, allowing the RSS assembly to continue drilling seamlessly to TD. The 2.7+ days of rig time saved highlights the effectiveness of advanced sidetrack engineering, proving the TrackMaster OH system as the superior choice for high-efficiency wellbore exits.



CHALLENGE

Sidetracking in a 5⅝-inch open hole, 3- feet below the 7-inch casing shoe, required precise placement and milling in a hard, abrasive formation. Conventional methods had low success rates, demanding a high-performance alternative to minimize downtime and enable seamless RSS BHA deployment.

SOLUTION

- Deployed the TrackMaster OH whipstock with a 2° slide for precise sidetrack initiation
- Used a hybrid tri-mill to create a high-quality window and drill the rathole in one trip
- Partnered with the operator's team to optimize the sidetrack strategy for seamless RSS transition and improved drilling performance

RESULT

- Sidetrack completed in 9.5 hours as planned, showcasing efficiency and precision
- Hybrid tri-mill maintained a full-gauge window, ensuring optimal directional control
- RSS BHA passed smoothly, enabling uninterrupted drilling to TD
- The well was completed per plan, meeting all operational and reservoir objectives
- Over 2.7 days of rig time were saved, significantly reducing costs versus conventional sidetracking

WIS-FS-MKT-269_rev2

Middle East

Record-Breaking 5⅞ inch Open Hole Sidetrack Achieved with TrackMaster™ OH Whipstock

Longest open hole sidetrack deployment of a TrackMaster OH whipstock in the Middle East, tripping in hole through 2,400 feet of 5⅞ inch open hole

Engineering Milestone in the Middle East East: Precision Sidetrack Saves 2,400-ft Lateral with 5⅞ inch TrackMaster OH Whipstock

The customer had previously encountered multiple unsuccessful fishing operations, jeopardizing well progress and increasing non-productive time (NPT). Recognizing the urgency, the Wellbore Integrity Solutions' (WIS) Red Baron team collaborated closely with the operator, developing a fit-for-purpose sidetracking solution that minimized downtime and preserved a significant section of the wellbore.

Key operational strategies included:

- Rapid mobilization of tools and personnel on short notice, ensuring swift execution.
- Detailed wellbore evaluation using caliper logs of the 5⅞ inch open hole, providing essential data for whipstock positioning and washout pass-through mitigation for the 4½ inch by 7 inch expandable anchor.
- Adaptive tripping speeds during TIH, based on the caliper readings and real-time drag, preventing additional wellbore instability and ensuring a controlled descent to setting depth.
- Precision whipstock anchoring and window milling, enabling flawless passage for subsequent BHA runs and resumption of drilling.

This operation highlights WIS's ability to tackle complex wellbore departure challenges, setting a new industry benchmark for sidetrack efficiency in open hole environments. The success of this job underscores the TrackMaster OH system's superior adaptability, reliability, and performance, reinforcing WIS's role as a leader in wellbore departure solutions.

CHALLENGE

The operation required sidetracking in an open hole environment, navigating 2,400 feet of 5⅞ inch open hole with multiple washout zones before reaching the planned setting depth. Previous fishing attempts failed, increasing the urgency for a successful deployment and heightening operational risks. This necessitated a highly controlled deployment approach.

SOLUTION

- Deployed the TrackMaster OH whipstock system with a hybrid bi-mill assembly and bypass valve for efficient MWD-guided orientation, reliable milling, and successful sidetracking
- Used caliper logs to optimize 4½ inch × 7 inch expandable anchor placement for maximum stability
- Dynamically adjusted tripping speeds based on real-time washout assessments to optimize whipstock descent and prevent instability
- Executed a single-trip sidetrack to quickly resume drilling while preserving open hole footage

RESULT

- Sidetracked a 5⅞ inch open hole in a single trip, saving 2,400 feet of drilled wellbore
- Completed 10 ft window milling and 8 ft rat hole and drilled in 9 hours, ensuring efficient directional re-entry
- Hybrid bi-mill maintained full gauge, delivering a precision-cut sidetrack
- Directional motor BHA passed seamlessly, enabling uninterrupted well construction
- Set a regional record for the longest open-hole sidetrack, saving over 2.7 days of rig time, cutting costs significantly

UAE

Superior Dual Casing Milling Performance Achieved Across Multiple Wells, Reducing Well Abandonment Costs

Utilized ProMILL Duo® Technology to enhance performance, minimizing trips for 150 ft windows across multiple wells

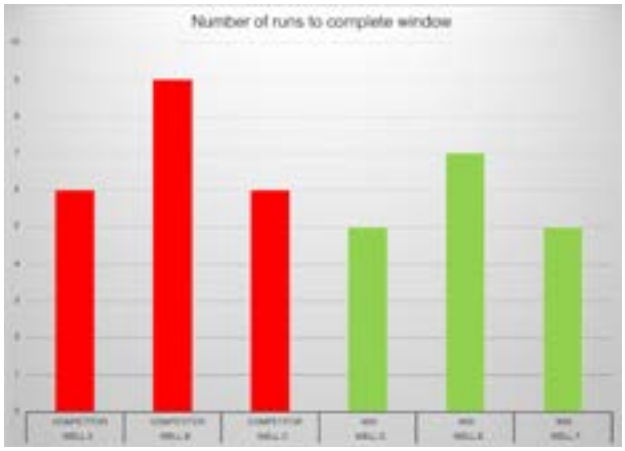
Optimizing Performance in Plug and Abandonment: Efficient Dual Casing Section Milling

Dual casing section milling is often perceived as unpredictable, with a high risk of exceeding planned operational schedules. However, through meticulous planning and optimized job design, Wellbore Integrity Solutions has demonstrated the ability to achieve operational targets with fewer trips compared to conventional market alternatives.

Key milestones contributing to this success include:

- **ProMILL® one-trip section milling and underreaming** BHA deployment eliminated the need for a separate run to scrape the outer casing after milling the inner casing. This enabled the completion of 9⅝ inch casing milling and 13⅜ inch ID scraping in just two runs across all three wells in the campaign.
- **TruEDGE™ insert technology** for inner casing milling allowed for continuous 170 ft milling runs to total depth (TD), eliminating the need for unplanned additional runs.
- **ProMILL Duo® technology** for outer casing milling minimized the number of required runs by utilizing mill-ahead knives from the first run, removing the need for dedicated cut-out runs typically required by other technologies.

This streamlined approach significantly reduced rig time and enhanced operational efficiency in plug and abandonment operations.



CHALLENGE

Mill a 150 foot window through 9⅝ inch inner casing and 13⅜ inch outer casing to prepare for setting a rock-to-rock abandonment plug.

SOLUTION

A four-step strategy utilizing ProMILL technology was designed as follows:

- Perform a dedicated trip to cut the inner casing using the 8200 K-Mill™.
- Deploy the 8000 ProMILL system to section mill the inner casing and scrape the outer casing ID in a single trip
- Use 8000 ProMILL Duo BHAs to mill the outer casing
- Deploy the standalone ProMILL HRU to enlarge the formation behind the casing up to 17½ inch

RESULT

- Successfully deployed the ProMILL section milling and scraping BHA, eliminating the need for dedicated scraping runs
- Successfully deployed the ProMILL Duo to mill the outer casing, achieving a 150 ft window in just two runs for two out of three jobs
- Wells were successfully abandoned by the customer after completing the final underreaming operations

Middle East

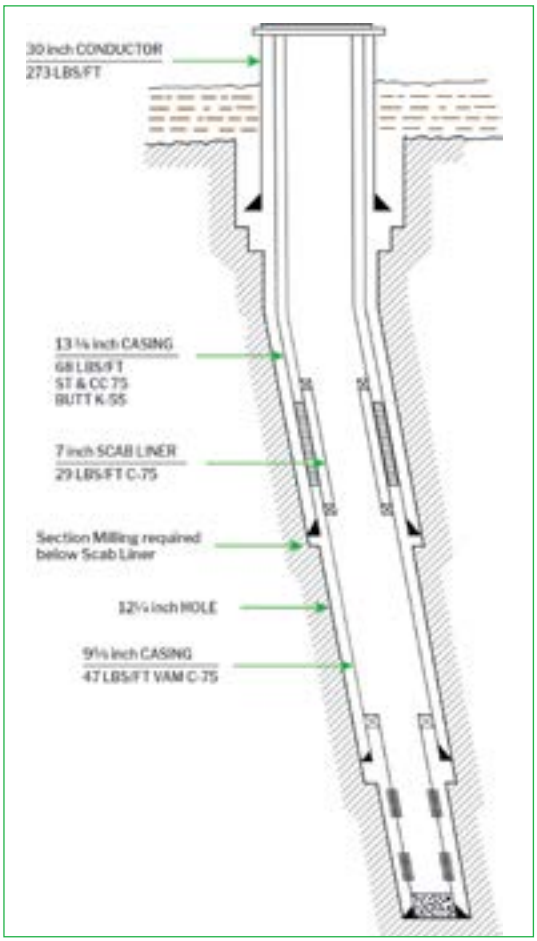
6000 ProMILL Duo® Dual Casing Section Mill Enables Abandonment Operations Below a 7-inch Scab Liner

An innovative solution was implemented to mill a 9⅝-inch window using tools capable of drifting through a 7-inch scab liner positioned above the desired window depth

Milling a Single Casing Window Below a Scab Liner Using Dual Casing Milling Technology for the First Time

A key customer in the Middle East urgently needed to set a barrier across a 9⅝-inch casing. However, a restriction above the target depth—caused by a 7-inch scab liner installed during previous workover operations—prevented the use of standard section milling tools. These tools, with a maximum outer diameter of 8½ inches, could not pass through the 6-inch inner diameter of the scab liner.

To overcome this challenge, dual casing milling technology was recommended to drift the scab liner's ID, followed by milling the casing window using smaller-diameter tools from the 6000 ProMILL Duo™ system.



Complex well geometry for abandonment operations; window required on 9⅝-inch casing at 5,795 ft, however there is a 7-inch scab liner at 2,837 ft – 5,713 ft.

Because the 9⅝-inch casing could not be adequately drifted in advance for milling, a dedicated run with the 6000 ProMILL high-ratio underreamer (HRU) was executed to confirm clear access through the 9⅝-inch casing ID across the desired window interval. Once verified, section milling operations were successfully completed using ProMILL Duo technology, enabling the required well abandonment.

CHALLENGE

Mill a 150-foot window across 9⅝-inch casing at a depth where 8½-inch tools could not drift due to the presence of a 7-inch scab liner above.

SOLUTION

Standard section milling tools for 9⅝-inch casing could not pass through the 7-inch scab liner. To overcome this, dual casing milling technology was proposed to mill a single casing window using the 6000 ProMILL Duo tool.

To confirm free access below the restriction:

- A dedicated run with the 6000 ProMILL HRU, equipped with scrapper arms, was performed
- This setup served as a dummy/access bottomhole assembly (BHA)

RESULT

- Successfully cleaned and scraped the 9⅝-inch casing ID using the 6000 HRU prior to milling
- Deployed the 6000 ProMILL Duo through the 7-inch scab liner ID to open a window in the 9⅝-inch casing
- Completed a 150-foot window to enable well plug and abandonment

UAE

ProMAXX® System Provides Trip-Saving Solution for Offshore Operation in UAE

Single-trip cement plug verification and 13⅜-inch casing cut and pull saves two trips in a Middle East offshore field

13.375 inch casing pipe cutter knives post run dull condition

Single-Trip Cut and Pull Solution Saves Time and Cost in UAE Offshore P&A Campaign

Reducing operational time during Plug & Abandonment (P&A) activities directly translates to cost savings by minimizing rig time and supporting a more sustainable abandonment strategy.

In a recent offshore P&A campaign in the UAE, the operator required an efficient cut and pull (C&P) solution to recover 13⅜-inch casing. A critical requirement was verifying the integrity of a cement plug prior to performing the C&P. To address this challenge and explore a trip-saving approach, the operator engaged Wellbore Integrity Solutions (WIS).

WIS successfully delivered an integrated well intervention solution using the ProMAXX™ System, which enabled both cement plug verification and casing recovery in a single trip and maximized overall savings on the P&A operation.

The modular bottomhole assembly (BHA) was designed to:

- Drill out and verify the cement plug

- Pressure test the barrier

- Cut and retrieve the 13⅜-inch casing

Following plug verification, an activation ball triggered the ProMAXX spear and pipe cutter. The cutter was positioned, casing pulled into tension, and successfully cut within five minutes. The spear was then disengaged, and the blowout preventer (BOP) rigged down to enable full casing recovery.

This integrated single-trip solution eliminated two additional runs, delivering significant time and cost savings on the offshore exploratory well.

CHALLENGE

Sidetracking inside a 26-inch conductor casing at 144 meters depth posed challenges, including no commercial system and the need for a lower window opening. Conventional methods were unfeasible, requiring a precision-engineered whipstock for a stable wellbore exit.

SOLUTION

- Deployed a dummy 13⅜-inch casing without centralizers inside the 26-inch conductor to create gravity-assisted eccentricity and minimize the annular gap
- Applied a custom sidetracking approach using a low-side oriented 13⅜-inch TrackMaster Select™ whipstock system for efficient dual-casing milling and rathole drilling
- Executed a two-trip strategy for optimal performance:
  - Trip 1: Milled a precise, full-gauge window using a custom parameters roadmap
  - Trip 2: Performed a cleanout run to ensure smooth passage of the 12¼-inch directional motor BHA

RESULT

- Successfully set the 13⅜-inch whipstock on the low side, milled a dual-casing window (13⅜-inch × 26-inch), and drilled a 7-meter rathole in one trip
- Operation met all objectives, enabling a reliable sidetrack and minimizing rig time

wellboreintegrity.com

NORTH AMERICA (NAM)

Alaska

TrackMaster Nexus™ Doubles Tripping Speed, Achieves Low-Side Exit in North Slope Alaska Re-Entry Well

Low-side exit enhances flexibility in wellbore trajectory design

TrackMaster Nexus™ Whipstock System – Single Trip 9⅝ inch Low-Side Exit

In a North Slope re-entry well, a 9⅝-inch TrackMaster Nexus whipstock system anchored with a permanent packer was deployed to isolate the parent wellbore in compliance with regulatory requirements. The deviated wellbore exhibited a 39° inclination at the planned kickoff point, with a directional plan necessitating a low-side exit.

To enable smooth passage of a rotary steerable bottomhole assembly (BHA), a high-quality window with low dogleg severity (DLS) was essential. The whipstock system was paired with an 8½-inch integral tri-mill assembly featuring TruEdge™ cutters strategically positioned on the gauge area to enhance milling stability and maintain gauge integrity.

An improved whipstock-to-mill attachment method—featuring a high-strength integral lug twice as robust as conventional systems—enabled a significant increase in tripping speed, from 45 ft/min to 100 ft/min. Upon reaching setting depth, the whipstock was oriented 120° to the right of high side using measurement-while-drilling (MWD) tools to achieve the planned low-side exit.

The operation was executed in a single trip, successfully milling an 18 ft window and a 20 ft rat hole. Post-run inspection confirmed that the lead mill, dressed with TruEdge cutters, remained within 1/16" of nominal gauge—validating both tool integrity and cutter durability under challenging wellbore departure conditions.

CHALLENGE

- Plan and execute a sidetrack in a re-entry well through 9⅝-inch, 47.0 ppf L-80 casing
- Navigate a deviated wellbore with 39° inclination at setting depth
- Achieve a low-side cased-hole exit per directional plan
- Deliver a high-quality window to enable smooth passage of a rotary-steerable directional BHA

SOLUTION

- Deployed a one-trip 9⅝-inch CH TrackMaster Nexus whipstock system anchored with a permanent packer
- Utilized an 8½-inch TrackMaster Nexus integral tri-Mill with TruEdge cutters positioned on the gauge area for enhanced milling stability
- Configured the whipstock system specifically for a low-side exit

RESULT

- Doubled rig tripping speed from 45 ft/min to 100 ft/min
- Enabled orientation with MWD tools achieve low-side exit at 120° degrees right of high side
- Milled an 18 ft window and a 20 ft rat hole in a single trip with the 8½-inch TrackMaster Nexus tri-mill
- Lead mill dressed with TruEdge cutters measured 1/16 inch under gauge.

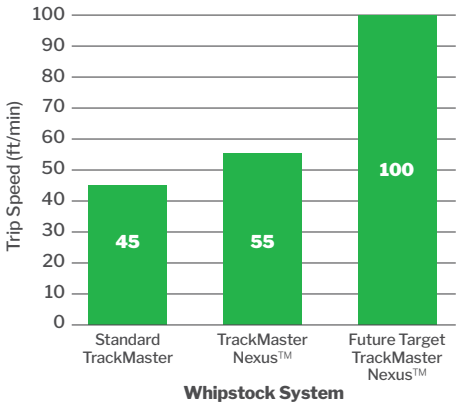
Permian Basin

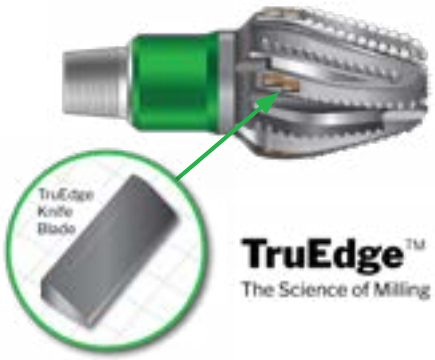
First TrackMaster Nexus™ Deployment Boosts Rig Tripping Efficiency by 23%

Unrivaled technology, experience, and engineering support drive a successful deployment of the first TrackMaster Nexus whipstock system in North America for a global operator

Enhancing Downhole Performance with the TrackMaster Nexus Whipstock System

The TrackMaster Nexus™ system enhanced downhole reliability through a redesigned milling assembly attachment, incorporating an integral lug that is twice as strong as the original design. This improvement doubled both axial and torsional load capacity, enabling higher tripping speeds. The system was run in hole at 55 ft/min, achieving a 23% efficiency gain over standard whipstock systems. Future deployments are targeting 100 ft/min to unlock additional time and cost savings. These advancements significantly reduced operational time and eliminated the need for a well-prep cleanout run prior to deploying the TrackMaster Nexus system.





Whipstock Size: 9⅝ inch TrackMaster Nexus
CH Exit Size: 9⅝ inch 40# L80-IC
Mill Type: 8¾ inch TrackMaster Nexus Tri-Mill
Sidetrack Depth: 5,555 ft MD
DLS @ Whipstock: ~0.70° /100 ft
Max Pass Through DLS: 2.31° /100 ft
Inclination @ Whipstock: 10°

CHALLENGE

Plan and execute a cased hole sidetrack operation from a 9⅝ inch 40# L80-IC casing by delivering a high-quality window, ensuring smooth transition into the sidetracked wellbore.

SOLUTION

- One-trip 9⅝ inch CH TrackMaster Nexus whipstock system with hydraulic anchor
- 8¾ inch TrackMaster Nexus Tri-Mill Assembly with TruEdge™ cutters strategically placed on gauge area
- State-of-the-art one-piece integral mill mandrel design was deployed for this challenging application

RESULT

- Achieved a 23% increase in tripping speed efficiency over standard whipstock systems
- Completed an 18 ft window and 6 ft rat hole in a single trip using the 8¾ inch TrackMaster Nexus Tri-Mill
- Proprietary TruEdge cutters maintained gauge, measuring ⅛ inch under with 50% less wear than standard TrackMaster Tri-Mill from offset well
- Delivered a high-quality window, ensuring smooth pass through with directional BHA and subsequent casing string

WIS-FS-MKT-276_rev3

wellboreintegrity.com

Permian Basin

TrackMaster Nexus™ Whipstock System Boosts Tripping Speed by 122%

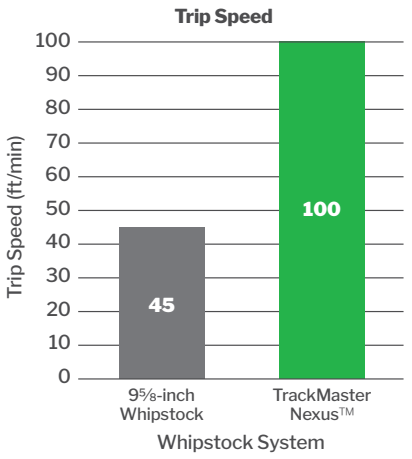
Enhanced mill-to-whipstock interface with TrackMaster Nexus increases tripping speed to 100 ft/min

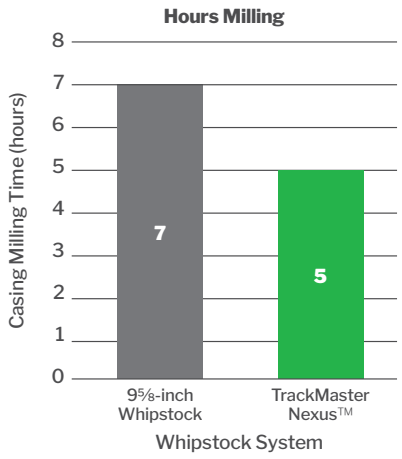
Increased Efficiency and Streamlined Operations

The TrackMaster Nexus™ whipstock system delivered enhanced operational reliability through an improved milling assembly attachment design. A key feature was the high-strength integral lug, which doubled both axial and torsional load capacities compared to the previous generation.

This advancement enabled faster tripping speeds, with the system run in hole at 100 ft/min—resulting in a 122% efficiency gain over conventional whipstock systems.

Additionally, the whipstock was deployed with an integrated casing scraper mounted below the anchor, allowing simultaneous wellbore cleaning and eliminating the need for a separate cleanout run. This streamlined approach reduced rig time and improved overall operational efficiency





Whipstock Size: 9⅝-inch TrackMaster Nexus
CH Exit Size: 9⅝-inch 40# L80
Mill Type: 8¾-inch TrackMaster Nexus Tri-Mill
Sidetrack Depth: 5,440 ft MD
Inclination: 3.5°
Max Pass Through DLS: 1.88° /100 ft

CHALLENGE

- Execute a cased hole sidetrack operation through 9-5/8 inch, 40 lb/ft L80 casing
- Simultaneously scrape the casing during the trip in hole
- Ensure precise window milling and a smooth trajectory transition into the sidetracked wellbore

SOLUTION

- Deployed a one-trip 9-5/8 inch CH TrackMaster™ Nexus whipstock system with hydraulic anchor
- Utilized an 8-3/4 inch TrackMaster Nexus tri-mill assembly, featuring a hybrid lead mill and TruEdge™ cutters strategically positioned on the gauge area
- Integrated a casing scraper mounted below the anchor assembly to enable simultaneous wellbore cleaning during deployment

RESULT

- Increased tripping speed to 100 ft/min while deploying the TrackMaster Nexus system
- Integral casing scraper eliminated the need for a dedicated cleanout trip
- Completed milling of an 18-foot casing exit window in just 5 hours, followed by a 14-foot rat hole in 1¼ hours—all in a single trip
- Reduced casing milling time by 30%, delivering an 18 foot window in 5 hours
- TruEdge cutters on the lead mill measured ⅛ inch under gauge; the dress mill remained in gauge, confirming tool durability and precision

WIS-FS-MKT-289_r3

CASPIAN (CAS)

Kazakhstan

Successful Execution of the First ProMILL™ Milling and Underrreaming Job in Central Asia

Successful deployment of the 5500 ProMILL for high-grade section milling and outer casing ID scraping in one trip

Cost-Efficient, Single-Trip Solution

A key customer in Kazakhstan required a cost-effective and robust solution to section mill high-grade, H_2S-resistant 7 in casing while also scraping the inner diameter (ID) of the outer 9⅝ in casing. The objective was to achieve a minimum of 16 m of milled and scraped interval to accommodate a bridge plug, along with sufficient lengths of bismuth and cement plugs.

Wellbore Integrity Solutions proposed the ProMILL® system, a trip-saving solution integrating the 5500 K-Mill™, featuring knives equipped with advanced TruEdge™ insert technology, and the 5500 high-ratio underreamer (HRU) with specially designed PDC-inserted scraper blocks.

Comprehensive Pre-Job Preparation

All tools were sourced, inspected, and function/pressure tested to ensure reliability. Knives, cutters' sweeps, and other critical parameters were verified for optimal compatibility with the job requirements. Hydraulic analysis was conducted based on the provided milling fluid data to determine the optimal operating parameters for each stage of the ProMILL execution, including cut-out, milling, and HRU deployment.

Field Execution

During the milling phase, optimal parameters were established, enabling the successful milling of a 20.9 m section of high-strength casing at an average rate of penetration (ROP) of 0.31 m/hr. Following ball-drop activation of the HRU, the total milled and scraped interval reached 19.8 m, exceeding the customer's minimum requirement—all completed in a single trip.

The K-Mill knives exhibited only 16% wear, highlighting the exceptional durability of the proprietary TruEdge insert technology, even after 67.3 hours of continuous milling.

CHALLENGE

- Mill high-grade, H_2S-resistant 7 in 32 ppf casing (SM-90SSU) inside a 9⅝ in casing
- Mill through two couplings
- Use slightly under-gauged stabilizers to allow the BHA to pass through the upper 7 in 35 ppf casing with a smaller ID
- Achieve a minimum of 16 m milled and scraped interval in a single trip

SOLUTION

- Utilize the cost-effective ProMILL milling and scraping system to complete P&A objectives in a single trip
- Deploy TruEdge™ – inserted section mill knives to enhance durability, stabilization, and swarf quality
- Conduct comprehensive hydraulic analysis to determine optimal flow rates for efficient tool operation and improved swarf removal

RESULT

- Achieved 20.9 m of section milled window in a single trip, exceeding initial objectives
- TruEdge inserts performed exceptionally, producing easily removable swarf and exhibiting only 16% knife wear
- Completed the job with zero NPT and no HSE-related incidents

WIS-FS-MKT-270_rev3

Delivering Results. We strive to provide superior products and solutions that drive results for our customers.

Mission — Vision — Values — Behaviors

OUR MISSION

Create a people centric company delivering profitability, growth, and a greener future focusing on superior technology, value, and service quality for our customers.

OUR VISION

To be recognized globally, focused on innovative solutions to increase asset value, operational efficiency, and reduce environmental risk for all our futures.

OUR VALUES

Well-Being and Environmental Stewardship

Protect our people; preserve the communities and environments where we work.

Guiding Behaviors:

- Safety and respect for the environment guides all our decisions
- Support work life harmony
- Mental health is as important as physical
- Everyone is responsible and accountable to act safely and look after others

Trust and Teamwork

Conduct business with transparency, inclusivity, and trust.

Guiding Behaviors:

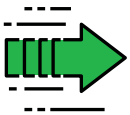
- Build diverse teams; respect different viewpoints
- Be transparent and inclusive in open/honest communication
- Everyone has a voice
- Encourage collaboration; share ideas, lessons learned, information and seeks help and to help others

Customer Focus

Strive to exceed customer expectations.

Guiding Behaviors:

- Understand customers needs, requirements and values
- Take ownership and accountability to address problems and opportunities
- Collaborate with customers and understand everyone has a role in providing the best solution
- Strategic thinking



Deliver Results

Drive financial performance for WIS stakeholders and customers.

Guiding Behaviors:

- Deliver quality products and customer services
- Be cost and profitability conscious for all products and services delivered
- Focus on maximizing asset value for customers while reducing risk and/or time
- Focus on training and development

Enterprising

Be open and receptive to creative thinking.

Guiding Behaviors:

- Welcome new ideas, opportunities, and ways of working
- Reward entrepreneurial thinking and endeavors
- Challenge each other to stretch beyond the norm
- Employees are empowered and supported to step out of their comfort zones

Wellbore Integrity Solutions
1310 Rankin Road
Houston, Texas 77073 USA

Specifications are current at the time of printing.

12/25 WIS-MKT-299