TRACKMASTER SELECT
Modular whipstock sidetracking system
TrackMaster Select

The TrackMaster Select® modular whipstock sidetracking system delivers quality, full-gauge windows that are tailored to each application.

The system’s customized mills enable superior window exits in high-grade steel and chrome casings as well as in formations with unconfined compressive strengths of more than 40,000 psi.

APPLICATIONS
Sidetracking from 4½-in to 20-in casing sizes for
- all grades of casing exits
- expandable casing exits
- liner exits
- low-side casing exits
- dual and triple casing exits
- restricted holes

BENEFITS
- High-quality, application-specific casing exits
- One-trip reliability
- Efficient, extended-length rathole drilling in high- to low-strength formations

FEATURES
- Multiramp whipstock that enhances milling and improves effective dogleg across exit window
- Whipstock mills that efficiently deliver casing exits and ratholes
- Anchor options that enable a fully retrievable whipstock system and an isolation packing element
- Available one-trip set and drill-ahead systems

The TrackMaster Select system offers effective casing exits in standard- and high-grade steel and chrome casings.
The TrackMaster Select system uses engineered wellbore departure design, modeling, and simulation to improve operational efficiencies in any location while reducing NPT.

- WhipSim* whipstock simulation software enables modeling the milling operation and determining the result geometry of the milled window.
- i-DRILL* integrated dynamic system analysis service uses predictive modeling to identify solutions that minimize vibrations and stick/slip during drilling operations and optimize BHA performance for a given environment.
- Runner* drillstring analysis program optimizes placement of the drilling jar and jar accelerator to provide the maximum potential of the tools should they be needed during differential sticking pipe risk situations.

Engineers also use the IDEAS* integrated dynamic design and analysis platform to test mill behavior and to optimize the mill cutting structure for each operation.

**Dynamic System Design And Modeling**

**Casing Exit Window Modeling**

WhipSim software models the milling operation, the window geometry of the milled window, and the pass-through capability of the follow-up assemblies for the completed window.

The software is used to predict:

- window geometry on exit casing
- size and shape of the wellbore section formed by the whipstock, casing window, and formation
- rathole trajectory
- curvature and dogleg severity (DLS) of liners or BHAs going through the sidetrack system.

WhipSim software analyses help ensure that completion strings are not affected by the dogleg across the whipstock. The software calculates DLS for a liner or BHA pass-through and determines the forces and stress of the liner or BHA.

**Optimized Whipstock System Design**

The i-DRILL service uses predictive modeling to identify application-specific solutions that minimize vibrations and stick/slip and that optimize BHA performance. It also quantifies vibrations and ROP as a function of time by combining steel and rock cutting models based on extensive laboratory testing. Each component of the BHA and drilling is simulated and analyzed.

Using offset well data, surface data, and downhole measurements, the i-DRILL service creates a virtual drilling environment. Simulating the drilling operation enables evaluating the root causes of inefficient and damaging BHA behavior. Multiple approaches for improving milling performance and avoiding milling risks can be evaluated using sophisticated dynamic analysis.

**Surface Parameter Modeling And Real-Time Analysis**

The Runner drillstring analysis program provides a complete sidetracking operation model to help analyze surface parameters, torque and drag, setting operations for anchors and shear bolt activation, and contact forces and buckle states of the working string in the departure operation. The program performs modeling for pre-run analysis and for postjob verification. Once the actual operation has begun, the Runner program provides real-time analysis of the modeled parameters as compared with the actual parameters.
**Bimill And Trimill Configurations**

A variety of mill cutting structures deliver efficient and cost-effective performance in any sidetracking operation.

**Follow and dress mill configuration**

The TrackMaster Select system is designed to offer two- or three-mill configurations, providing advanced window milling capabilities. The bimill design includes both the lead mill and the follow mill. All three mills are included in the trimill configuration.

**Milling options**

**FasTrack® one-trip mill**
- Drills conventional and extended ratholes efficiently
- Delivers consistent, fast, and reliable milling performance
- Offers increased durability with optional PDC cutters

**Hard-formation bimill**
- Reduces wear and improves impact resistance with high-density PDC cutting structure

**Carbide trimill**
- Drills 3- to 15-ft ratholes effectively
- Provides cost-effective milling performance with standard carbide inserts

**Quality Windows That Enhance Completions**

The TrackMaster Select system’s three-part ramp-and-mill design offers milling efficiency and robust casing exit windows for improved completion operations.
- The fast cutout ramp at the top of the whipstock cradles a full-gauge lead mill while running in hole and sets the necessary kickoff angle to initiate cutout. The result is a full-gauge window within a few inches of the cutout.
- The full-gauge section of the whipstock extends the window and maximizes the window quality while reducing DLS.
- The midramp accelerates the lead mill past its center point, facilitating completion of the window and rathole in one run.

**Bimill And Trimill Configurations**

The lead and follow mills work together to create two unique cutouts. As milling continues, a single window is completed. This two-mill configuration enables placing the window top above the whipstock slide for improved effective dogleg across casing exits and kickoffs.
The TrackMaster Select system incorporates a patented multiple-ramp whipstock design to enhance critical milling processes. Casing engagement and removal are optimized by matching the angles between the whip face and the milling tool.

The TrackMaster Select system’s hookup attachment allows flexibility between the milling assembly and the whipstock. This flexibility enables higher torque tolerances during orientation and trouble-free passage through doglegs when tripping in.

A one-way kickover hinge provides an additional flex point during orientation and when running in hole. It also ensures that the whipstock ramp is positioned to direct the mill to the initial cutout point in the casing.

**Multiramp Slide and Hinge Flexibility**

The TrackMaster Select system has five types of anchors to secure the whipstock system during sidetracking operations.

1. The hydraulically actuated expandable anchor secures placement of the whipstock in the wellbore and accommodates a range of casing sizes and any tool size when borehole isolation with a packing element is not required.
2. The retrievable anchor is a hydraulically set anchor system.
3. The retrievable anchor with packer assembly is a hydraulically set anchor system for use when borehole isolation with a packing element is required.
4. The permanent packer anchor is used when borehole isolation with a permanent barrier is required.
5. The mechanical anchor is weight-set actuated and retrievable and features an antirotational slip design.

**Anchoring options**

Secure placement for effective performance

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High-Efficiency Milling, Casing Exit, and Sidetracking

The TrackMaster Select system provides casing exits and sidetracking in a single trip. Designed for high-efficiency operations, it reduces trips, milling time, and rig time required for reentry into an existing wellbore.

ANCHOR SETTING
The casing exit system base is a mechanically set, single-grip anchor that is run to the desired depth on the drillpipe or workstring and connected to the whipstock slide and bimill assembly by a shear bolt.

MILLING
Compression enables setting the anchor to lock firmly into place within the casing string, and weight is applied to shear the lead mill from the top of the whipstock slide. For short ratholes, whipstock anchor setting, casing exit, and drilling are accomplished in a single trip.

CASING EXITS
Once free from the whipstock slide, the bimill provides a casing exit and smooth window to facilitate sidetracks and reentries. The spacing of the lead and follow mill, along with the profile of the whipstock slide top, provide a full-gauge window above the top of the whipstock, enabling a minimized dogleg across the casing exit and reducing the effects on subsequent tubulars and completion strings.

Mechanical anchor.
CASE STUDIES

Mexico’s first deepwater low-side casing exit performed in one trip

LOW-SIDE CASING EXIT SAVES USD 655,000
PEMEX used the TrackMaster Select system to perform the first deepwater low-side casing exit in Mexico. After borehole instability caused a fish to be left in the borehole, the TrackMaster Select system was modified for the low-side sidetracking.

The system milled an 11¾-in casing exit with a low-side toolface orientation of 154° and drilled a rathole in one trip so that drilling of the section could continue. Low-side orientation reduced wellbore inclination, offering a complete solution for the directional trajectory and saving USD 655,000.

MODULAR WHIPSTOCK SIDETRACKING SYSTEM SETS PERFORMANCE LEVEL IN TEXAS OIL FIELD
An operator drilling in a hard and cherty limestone field outside Midland, Texas, US, ran the TrackMaster Select system with the FasTrack one-trip mill to create a window and drill a rathole in one run. Sidetracking out of the 7-in casing required a cutting structure that could mill the casing and drill the rathole in the hard formation.

A clean, full-gauge window was milled in 1.5 hours with the bottom of the window at 1,782 ft [543.2 m]. The 3-ft [0.9-m] rathole was drilled in 0.5 hour, and the entire operation was completed in one run.

Single-trip, dual-casing exit performed for the first time in India

MODULAR WHIPSTOCK SIDETRACKING SYSTEM SAVES 4 DAYS IN SOFT SHALE FORMATION
The TrackMaster Select system was used to perform the first single-trip, dual-casing exit offshore India. More than 22.9 ft [7 m] of casing was milled to create a full-gauge window, and 6.6 ft [2 m] of rathole was drilled in the soft shale formation.

The entire operation, which usually takes 8 days, was completed in only 4 days. The sidetracking BHA entered the rathole and successfully drilled ahead on the first attempt.

First exit through 30-in casing completed in Gulf of Suez

MODULAR WHIPSTOCK SIDETRACKING SYSTEM COMPLETES CASING EXIT AND RATHOLE IN 11 HOURS
In the Gulf of Suez’s East Zeit field, the TrackMaster Select system was designed with anchors large enough to set in a 30-in casing and drill a 20-ft [6.1-m] rathole for Dana Petroleum.

In a single trip, the 16-in OD TrackMaster Select system lead and follow mills completed a 17.5-in, 22-ft [6.7-m] long exit in the 30-in casing. The exit was milled and dressed in 11 hours—the first time an exit was completed through 30-in casing. The whipstock assembly also drilled a 20-ft rathole, enabling the 16-in directional BHA to pass through the casing exit and drill ahead without delays.
CASE STUDIES

World’s first triple-string casing exit performed in one run

MULTISTRING CASING EXIT REVIVES 80-YEAR-OLD WELL IN LESS THAN 5 HOURS
Using the TrackMaster Select system with an expandable anchor and FasTrack mill, an operator drilling in the Inglewood field, California, USA, milled the world’s first three-string casing exit on the first attempt. The triple-string exit successfully cut through 7-in, 8⅞-in, and 13⅜-in casings in less than 4 hours, and the well —first drilled in 1935 and later plugged and abandoned—was brought back to production in one run with less than 5 hours of milling time.

Largest-ever tight-tolerance liner in 20-in casing achieved with TrackMaster Select system

A North Sea operator wanted to perform a slot recovery operation on a well in a mature oil and gas field. The plan was to create access for a new wellbore by setting a whipstock in the original 20-in casing and milling a window through which a large 17-in liner could be run. The biggest challenges were high dogleg across the whipstock and delivery of the smooth window.

The TrackMaster Select system was chosen for the operation because it uses sophisticated dynamic modeling to engineer a wellbore departure design. Prejob planning and dynamic modeling and simulation delivered operational efficiencies that enabled milling a usable window. Isolating the damaged 20-in pipe saved 5 days of rig time, and running the large 17-in liner set a world record. The operator plans to use the TrackMaster Select system with dynamic modeling on all future workovers where new intermediate barrier casing and liner string are required.