



Tubular Running Services

Nabors' technology improves safety, reliability and efficiency while running casing





Nabors Technology Packages Get Casing to Bottom Safely and Efficiently

There's a better way to run casing. Nabors provides a wide range of casing running services that significantly improves safety, connection integrity and operating efficiency compared to traditional methods.

The traditional method for running casing crowds the rig floor with equipment and requires crews of up to eight people. The crowded workspace and manual pipe handling expose personnel to safety hazards. Conventional power tongs struggle to make up consistent, verifiable connections to assure string integrity. Traditional methods are subject to delays during labor intensive rig-up and rig-down activities, and while transitioning between casing and cementing tasks. During cementing operations, conventional equipment lacks the ability to rotate casing, resulting in a less than optimal cement bond.

Full Range of Tubular Running Services

Nabors offers a full range of tubular running services to match operators' requirements and preferences.

While operators can benefit from using the Casing Drive System™ (CDS) along with conventional casing running equipment, greater safety and efficiency advantages can be gained by employing a larger scope of Nabors technologies to automate operations and reduce manual pipe handling. In addition to a lower total cost of ownership, the greatest improvements in safety, reliability, efficiency and well integrity can be realized when casing running technologies are fully integrated with the Nabors drilling rig and its Rigtelligent™ controls.

Nabors tubular running services are available in four tiered packages:

▶ LEVEL 1: COMBINATION PACKAGE

For operators who prefer to supplement conventional casing running with new technology, the Combination Package includes a CDS as part of a full suite of tubular running services equipment. The package includes power tongs, bails, hand slips, conventional elevators and ancillary equipment. In this configuration, the CDS tool is used for pipe handling, and the power tongs are used to make up connections. Because of the large amount of included equipment, this option requires more rig-up time than other packages. It also calls for a crew of up to eight people.

▶ LEVEL 2: SILVER PACKAGE

The Silver Package eliminates the power tongs and relies on the CDS and top drive to make up connections. The TesTORK® system is included to monitor and record connection specifications. This package improves safety by removing the power tongs and reducing crew size to six personnel. It also improves filling, circulation and reaming capabilities.

▶ LEVEL 3: PLATINUM PACKAGE

The Platinum Package further improves safety by replacing hand slips (used on the Combination and Silver Packages) with automated, flush mount slips. Automated slips reduce personnel exposure on the rig floor and save time. The Platinum Package requires a crew of four personnel.

▶ LEVEL 4: CRT-READY™ PACKAGE

The CRT-Ready™ Package fully integrates the casing running tools with the Nabors drilling rig. Equipment supplied with this package is the same as for the Platinum Package. However at this level, CDS hydraulics are integrated with the rig's operating control system, allowing the top drive and other rig components to be operated from the driller's chair using Rigtelligent™ controls. All equipment is operated by two trained Nabors personnel assigned to the rig. This approach reduces third parties on location and contributes to more efficient operations.

	LEVEL 1: COMBINATION	LEVEL 2: SILVER	LEVEL 3: PLATINUM	LEVEL 4: CRT-READY™
Major Equipment	CDS tool with HPU	CDS tool with HPU	CDS tool with HPU	CDS tool complete with Hardware / Software Integration
	Power Tongs and Units	Handling Equipment w/Bails	Handling Equipment w/Bails	Handling Equipment w/Bails
	Handling Equipment w/Bails	TesTORK® (Current Configuration)	TesTORK® (Auto-start Software)	TesTORK® (Software Integration)
	Contech Conventional TT			
Crew Size	8 Personnel	6 Personnel	4 Personnel	2 Personnel
Rig-up and down (hours)	3	2	2	1
Risk/Hazard Reduction	-	Yes	Yes	Yes
Simplicity/Versatility	-	Yes	Yes	Yes
Consistency/Repeatability	-	Yes	Yes	Yes
Rotate/Ream	Limited	Yes	Yes	Yes
Rotate + Cement	Yes	Yes	Yes	Yes
Automatic Torque Turn	No	No	Yes	Yes
Performance Metrics & Analytics	Manual	Manual	Manual	Automated
Auto-Start Feature	Manual	Manual	Automated	Automated

CDS workflows will not impair tubular running speeds.

CRT-Ready™ Package will optimize running speeds due to the automated performance features where learning trends can be instantly adopted.

Nabors Technology

Casing Drive System™

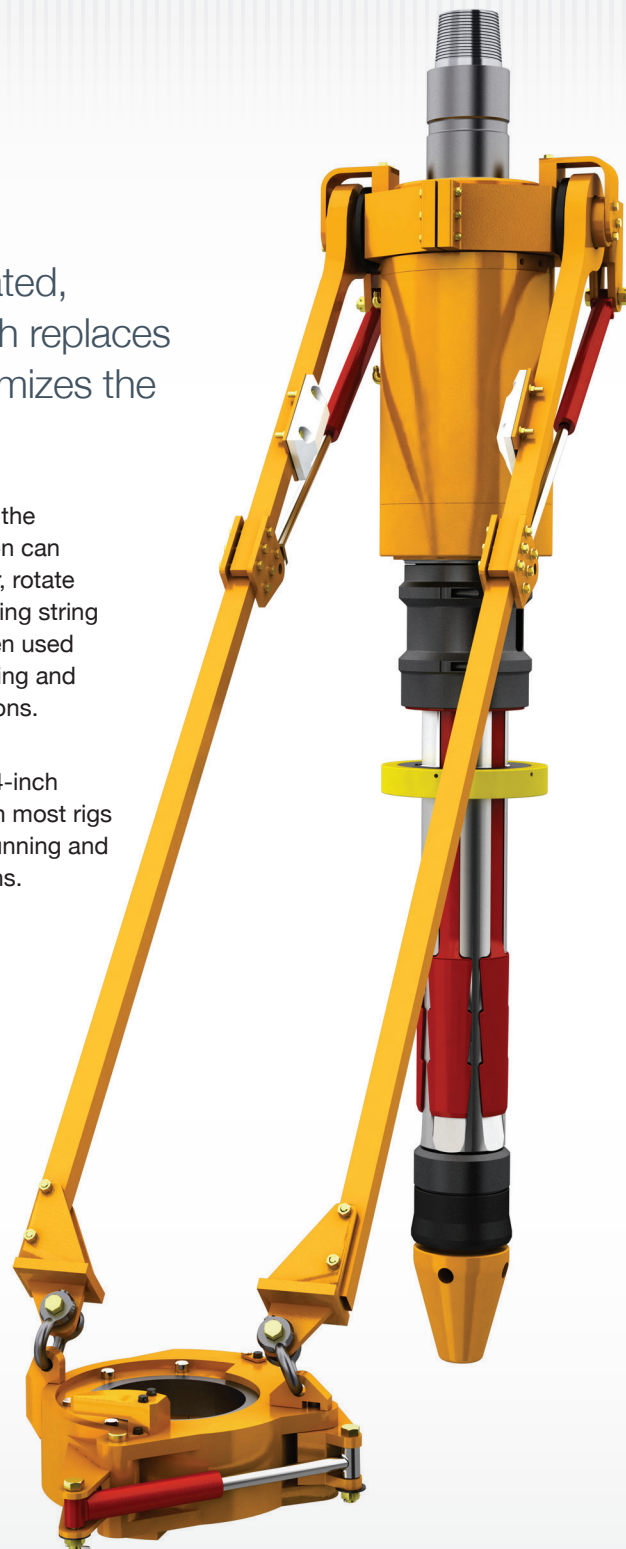
The Casing Drive System™ (CDS) is an automated, versatile and powerful casing running tool, which replaces conventional pipe handling equipment and minimizes the need for manual operations on the rig floor.

The CDS incorporates link tilts and a hydraulic single joint elevator, so the system can pick up casing directly at the V-door. The CDS includes an innovative link-tilt system that positions the casing joint over the hole, reducing manual pipe handling before the connection is made.

When used in conjunction with the top drive, the CDS replaces the power tongs and can make up connections to precise torque specifications, as controlled from the driller's console. The Nabors Zero Weight Interlock™ system prevents the string from dropping into the wellbore

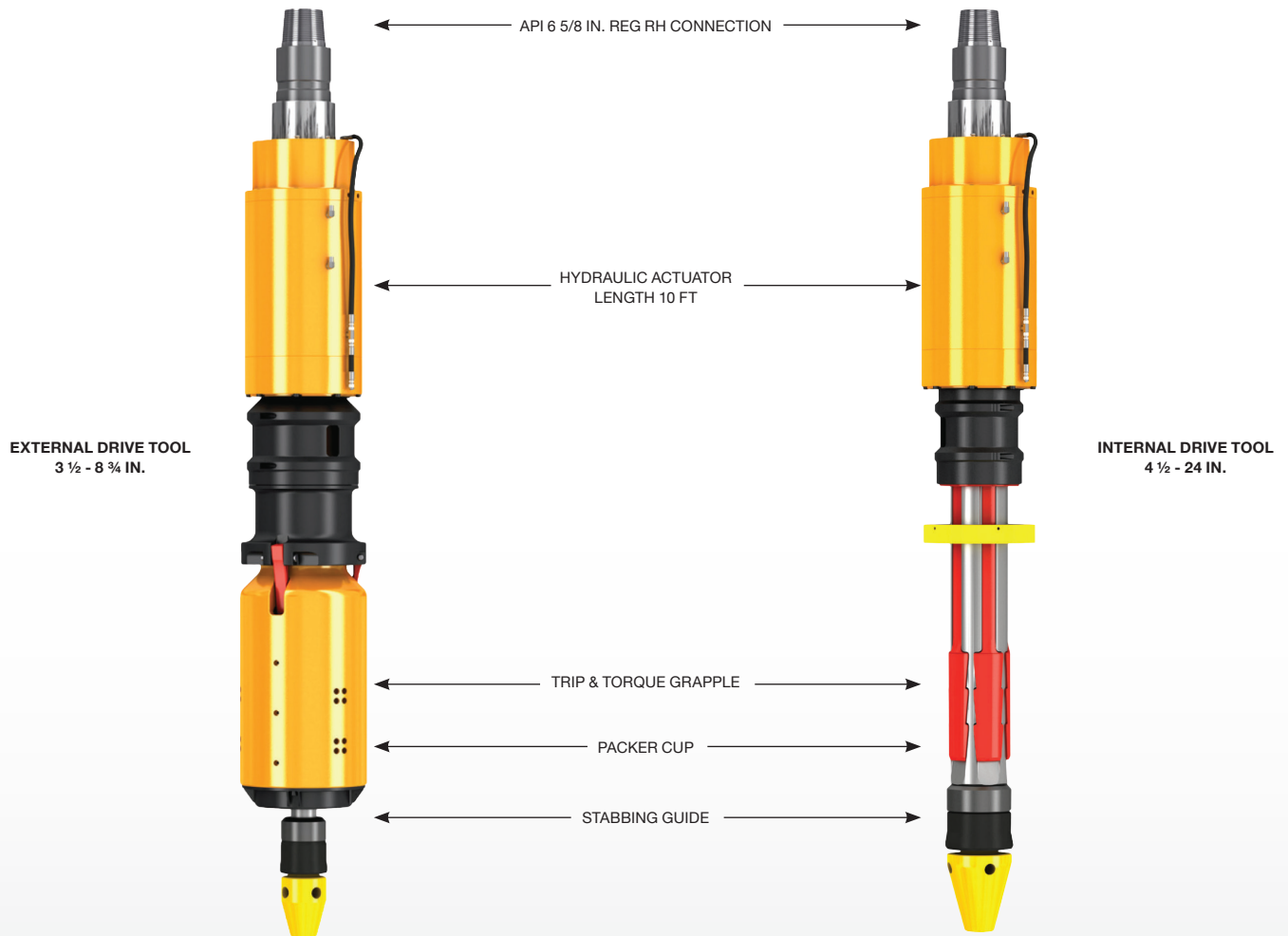
before the slips are set. Once the connection is made, circulation can begin, and the CDS can lower, rotate and reciprocate the entire casing string as required. The CDS has been used extensively in ream-while-casing and casing-while-drilling applications.

The CDS is available in many configurations to run 3½ to 24-inch casing, and is compatible with most rigs and a wide range of tubular running and casing-while-drilling operations.



CASING DRIVE SYSTEM™ SPECIFICATIONS

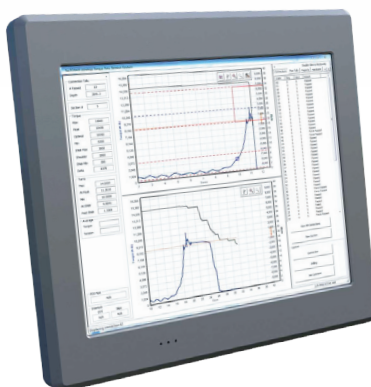
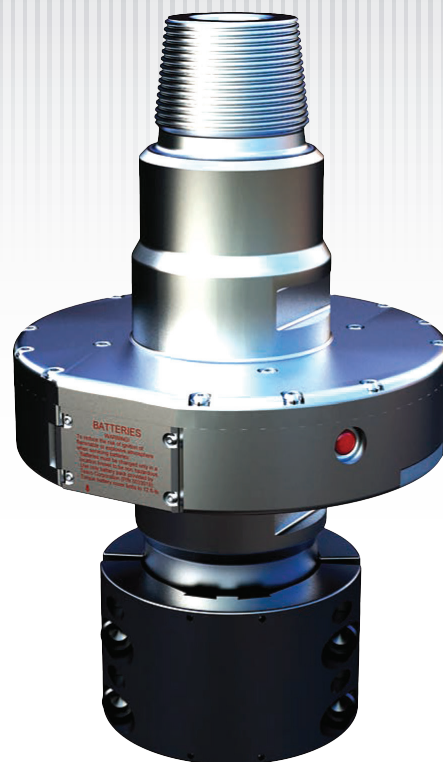
Hoisting Capacity	350 Ton External	500 Ton Internal	750 Ton Internal
Casing Sizes	3 ½ - 8 5/8 in.	4 ½ - 24 in.	9 5/8 - 20 in.
Length	10 ft	10 ft	19 ft
Maximum Torque	40,000 ft-lbs	40,000 ft-lbs	80,000 ft-lbs
Maximum Drilling Fluid Pressure	5,000 PSI	5,000 PSI	5,000 PSI
Maximum Operating Speed	200 RPM	200 RPM	100 RPM
Maximum Push Down Capacity	25,000 lbs	25,000 lbs	25,000 lbs



TesTORK® System

The wireless TesTORK® system accurately monitors connection torque, tension and the number of turns during connection makeup.

The TesTORK® sub includes high precision instrumentation. During connections, TesTORK® wirelessly transmits torque and rotational data in real time to a computer that logs and displays data on each connection. Precise measurement of connections enables accurate and consistent makeup and assures the integrity of connections.



Multi-Plug Launching System

The Multi-Plug Launching System (MPLS) can be used with the CDS to simplify, accelerate and increase the automation of the transition from casing running to cementing.

The MPLS is attached to the CDS with a pup joint and is used to remotely launch plugs or darts for single or multiple stage cementing. The MPLS launches plugs wirelessly without manual operation for improved safety and efficiency.

Casing Drive System™ Brings Advantages by Eliminating Power Tongs

CASING DRIVE SYSTEM™	VS.	POWER TONGS
<ul style="list-style-type: none"> - Controlled pipe handling - Clean and efficient rig floor - Personnel removed from Red Zone 	HSE	<ul style="list-style-type: none"> - Pinch points - Crush points - Heavy to maneuver - Personnel in the red zone
<ul style="list-style-type: none"> - Connection consistency, repeatability - Robust equipment - Fewer mechanical failures 	Quality	<ul style="list-style-type: none"> - Inconsistent make-up - Lack of control and repeatability - Mechanically intensive
<ul style="list-style-type: none"> - Smaller footprint and less equipment for faster rig-up with personnel outside of the Red Zone 	Rig-up	<ul style="list-style-type: none"> - Additional equipment, heavy hoses, increased risks due to housekeeping associated with additional equipment - Snubbing angles create torque variances
<ul style="list-style-type: none"> - Less equipment - Lower risk - Decreased overlap with other service providers 	Rig-down	<ul style="list-style-type: none"> - More equipment , more risk, interference with other service providers
<ul style="list-style-type: none"> - Accommodates 3 1/2 - 24 in. tubulars - Modular design - Ability to rotate and reciprocate 	Versatility	<ul style="list-style-type: none"> - Non-modular - Large equipment footprint - Multiple fail points - Cannot rotate casing and reciprocate
<ul style="list-style-type: none"> - Cementing capabilities - Efficient transition to cementing operations 	Cementing	<ul style="list-style-type: none"> - Cumbersome rig-down to transition of conventional cementing head
<ul style="list-style-type: none"> - Designed for casing-while-drilling operations - Robust with rare failures 	Reliability	<ul style="list-style-type: none"> - 65% of TRS downtime is Power Tong related
<ul style="list-style-type: none"> - Fewer people - Less injury exposure 	Personnel	<ul style="list-style-type: none"> - More labor-intensive - Personnel in Red Zone are subject to injury exposure
<ul style="list-style-type: none"> - Fewer pieces, tidy Red Zone - Fewer moving parts 	Footprint	<ul style="list-style-type: none"> - Red Zone clutter - Many moving parts - Tugger reliance increases risk for dropped hazards - Numerous pieces of equipment
<ul style="list-style-type: none"> - Controlled RPM, thread compensation, and torque parameters - Consistent push/pull forces 	Connection Integrity	<ul style="list-style-type: none"> - RPM variance - Spring compensation - Inconsistent hydraulic "dump" of connection make-up - Potential for human error



NABORS CASING DRIVE SYSTEM™ PACKAGE

AT A GLANCE



CONVENTIONAL RUNNING CASING WITH POWER TONGS

Nabors Tubular Running Service Highlights

- ▶ Reduces equipment footprint, personnel and safety hazard exposure
- ▶ Eliminates power tongs and safety “pinch points”
- ▶ Configurations to match operator preferences and work scope
- ▶ Handles most casing sizes and torque requirements
- ▶ Adaptable for triple, double and most super-single rigs
- ▶ Rigs up easily compared to conventional equipment suite
- ▶ Casing Drive System™ replaces all casing running equipment
- ▶ Unique link tilt design provides most efficient pipe handling available
- ▶ Patented Zero Weight Interlock™ safety lock system prevents dropped casing
- ▶ Eliminates flat time during fill and circulation activities
- ▶ Enables casing rotation while cementing to assure good cement job and predictable top of cement
- ▶ CRT-Ready™ Package maximizes use of Nabors rig during casing running
- ▶ TesTORK® monitoring system provides industry’s most accurate and repeatable connections
- ▶ Proven over a decade of field success in tortuous well applications and harsh casing-while-drilling environments

Decades of Tubular Running Service Experience

Nabors has decades of tubular running service experience and has leveraged this successful track record to design and deploy reliable and efficient casing running equipment. The Casing Drive System™ has been used on more than 100,000 wells worldwide to successfully run casing in deviated, horizontal and complex well and casing-while-drilling applications. All levels of our casing running are available wherever Nabors operates.

For more information, contact your Nabors Tubular Running Services representative.