

Never get stuck again

Improve management of downhole
pressure with continuous circulation system

Non-Stop Driller

Continuous Circulation System

The **Non-Stop Driller (NSD)** is a sub-based constant circulation system which enables the continuous circulation of drill fluids downhole while making or breaking drill pipe connections. The system has been designed with specific focus on the operators needs by improving drilling efficiency, operational safety, hole condition and equipment integration.

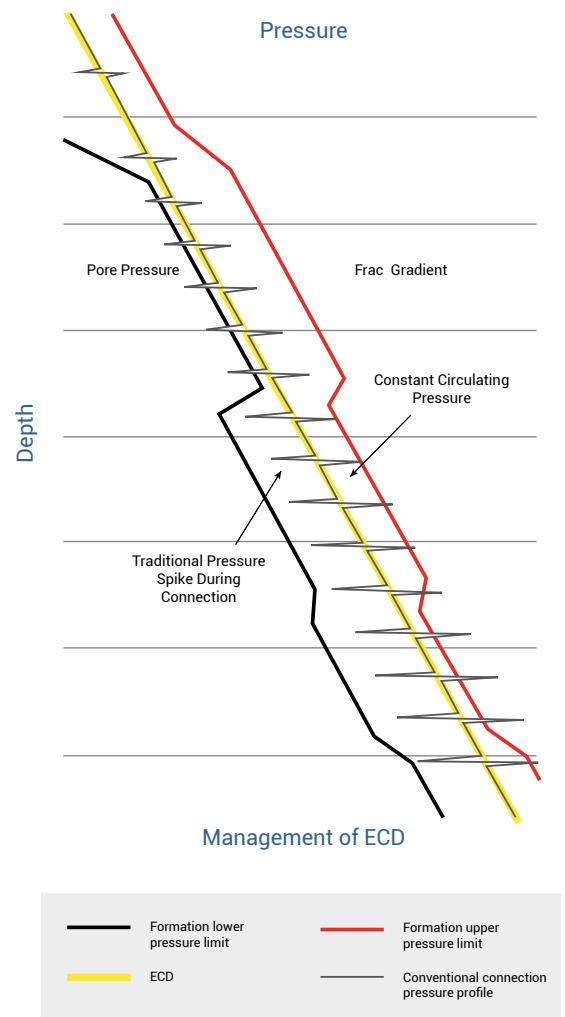
Providing constant equivalent circulating density and constant hole cleaning

The NSD continuous circulation system improves drilling performance and safety by maintaining constant circulation of drilling fluid to the wellbore when adding or removing drillpipe stands.

On and off pump cycling during connections in conventional rotary drilling causes bottom hole pressure fluctuations. These differences in downhole pressure can cause bottom hole pressure to either exceed fracture pressure or fall below pore pressure of the rock. Subsequently, these conditions increase the risk and cost of drilling the section by increasing the likelihood of nonproductive time related to hole instability, fluid loss, reservoir influxes, and stuck pipe.

On and off pump cycling also reduces the effectiveness of the drilling fluid to carry cuttings out of the hole. While pumps are turned off, cuttings fall down the wellbore in vertical wells or fall at transitional angles in deviated or horizontal wells. This increases the chance of incidents such as well pack-offs and stuck pipe.

NSD ensures constant bottomhole pressure while making connections, which is particularly critical when operating within narrow drilling margins that reduces non-productive time and enables fewer and deeper casing strings when pore-pressure and fracture-gradient windows are narrow.



Over **4500**
connections

105 sections
drilled over
5 continents

Over **730** days
of rig time saved



How the Non-Stop Driller works

Developed in the field to meet industry standards

Each stand to be drilled down requires a pre-installed sub. When the stand is drilled, the sub is used to create an access point to the drill string for circulation.

The NSD system utilizes an API rated high-pressure mud hose with an integrated quick connect mechanism. A remote controlled manifold is used to redirect the flow path of the drilling mud through the side entry valve in the NSD sub.

Closing the ball valve at the top of the side entry valve isolates drill string pressure allowing constant circulation during connections. When the connection is completed, the flow of drilling mud is redirected through the top drive and drilling continues with the NSD sub now an integral part of the drill string downhole.

All the components conform to API, ANSI, ASME and CE PED standards for pressure equipment and well control.

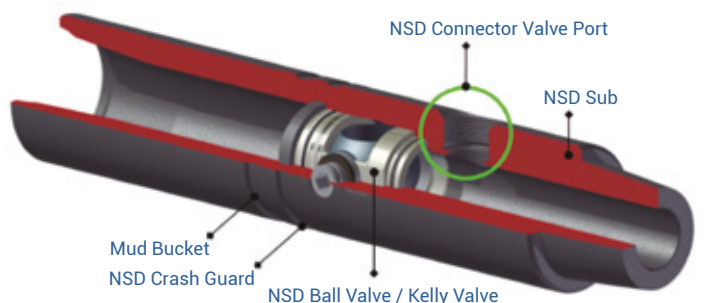
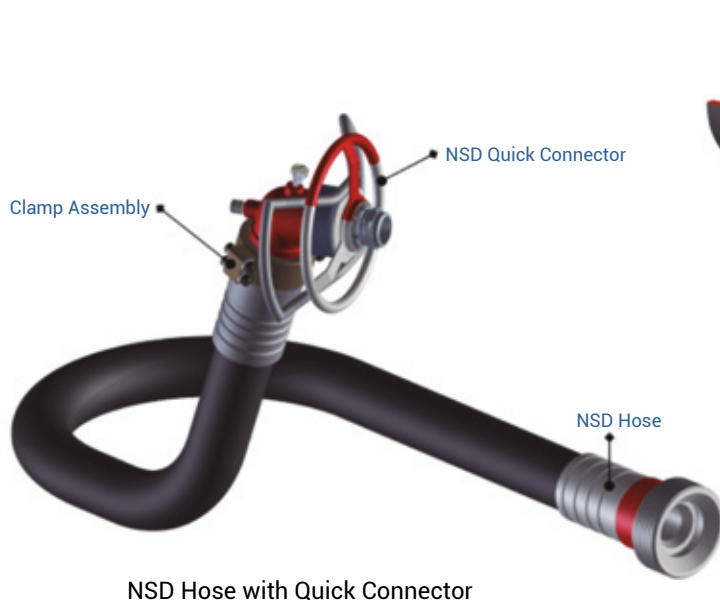
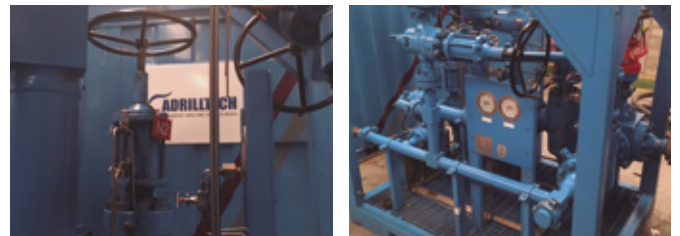


Technical Specification

Non-Stop Driller Sub

Connection	NC50 4-12" IF	5.5 DSTJ	5.5 FH	6-5/8" FH
Make-Up torque (ft.-lbs.)	30,700	62,900	52,000	69,200
Tensile Strength LBS	1,117,600	1,597,900	1,063,300	2,071,700
Working Pressure (PSI)	10,000 (API 7-1)	10,000 (API 7-1)	10,000 (API 7-1)	10,000 (API 7-1)
Shell Integrity (PSI)	15,000	15,000	15,000	15,000
Length inch	34	34	34	34
Outer Diameter inch	6-5/8	7	7.25	8.5
Inner Diameter inch	2.45	2.41	3	3,078
Drift ID inch	2.35	2.31	2.9	2.9
Flow rate for Sub (GPM)	1200	1200	1200	1600
Flow rate for Side entry (GPM)	600	600	600	600/1200
Side port Primary seal	Metal / Metal poppet	Metal / Metal poppet	Metal / Metal poppet	Metal / Metal poppet
Side port Secondary seal	Protective cap/ O-Ring	Protective cap/ O-Ring	Protective cap/ O-Ring	Protective cap/ O-Ring
Temperature Ratings °C	165	165	165	165
Body Material	AISI 4145M	AISI 4145M	AISI 4145M	AISI 4145M
Elastomers	Viton	Viton	Viton	Viton
Service	Standard Service	Standard Service	Standard Service	Standard Service
Maintenance Specifications	TH Hill DSI Level 3-5	TH Hill DSI Level 3-5	TH Hill DSI Level 3-5	TH Hill DSI Level 3-5

The NSD system features a uniquely modular design and small rig floor footprint that make for easy system integration with other rig technologies. All NSD units are designed to be shipped in standard CSC shipping containers. Both ISO corner blocks and offshore specification certification certified lifting pad eyes are provided on all container units.



Features

- > Primary metal-metal seal rated for 30,000 psi, and protective cap provides secondary barrier to wellbore fluid
- > Fully actuated valves controlled by a dedicated Human Machine Interface (HMI) system
- > Proprietary locking mechanism eliminates the possibility of release during operations
- > Integrated PRV provides independent pressure for NSD system
- > Most drill pipe connection sizes and connection
- > NSD sub retains access for ball drop tools and wireline services
- > Subs designed for 600 gpm through connection valves/ 1200 gpm through ball valve

Benefits

- > Enhances cleaning and provides continuous solids transport
- > Maintains a consistent annular pressure profile across the entire wellbore eliminating stability problems
- > Minimizes bottom hole pressure fluctuations in narrow Pore Pressure/ Fracture Gradient applications
- > Minimizes connection gas and reduces risk of kicks on connections

Continuous Circulation System Advantages

- > Managing bottom hole pressure
- > Managing ECD
- > Improve hole cleaning, reducing wiper trips
- > Eliminating connection gas
- > Reduced mud conditioning time
- > Improved wellbore stability
- > Reduced temperature for HPHT
- > Prevent stuck pipe/lost BHA's

Eliminates NPT

- > Stuck pipe incidents
- > Extended wellbore conditioning and nuisance gas circulation
- > Casing running problems related to hole condition
- > Excessive bottom hole temperatures and bottom hole Assembly (BHA) heat soak damage
- > Time required to re-establish two-phase circulation



Case Histories

Murphy Malaysia Kikeh Spar [14 wells, 28 sections]

Client identified problems with depleted reservoir zones resulting in drilling fluid losses. Relatively unconsolidated and poorly sorted sands present in the field geology. Drilling window narrow due to pore pressure/fracture pressure gradient uncertainties. Client predicted borehole instability, differential sticking, high background gas probability. Managed Pressure Drilling with Continuous Circulation System used to drill with lighter muds (WBM and OBM) and control the ECD/BHP accurately within the drilling window to avoid losses and NPT. Compact footprint of equipment meant this was easily achievable in a limited space environment offshore.

Oil Search PNG [22 wells, 22 sections]

Client observed multiple lost BHA's whilst drilling surface and intermediate sections leading to multiple side tracks. Losses observed up to and including total losses. Foam drilling technologies were identified and utilized however time spent adding surfactants and breaking down the foam before making a connection added 2-3 days to drilling each section. Heli-rig operating in the PNG Highlands so, equipment footprint and personnel numbers required to be small and light. Continuous Circulation system was used to eliminate stuck pipe and lost BHA's through maintaining foam drilling over each connection.

Client Base



Location: Indonesia
Description: Deepwater MPD with NSD



Oil Search

Location: Papua New Guinea
Description: Onshore continuous circulation (NSD)

ExxonMobil

Location: Papua New Guinea
Description: Onshore continuous circulation (NSD)



Location: Kurdistan
Description: Onshore continuous circulation (NSD)



Location: GoM
Description: Onshore / Offshore MPD (NSD)



Location: Indonesia
Description: Onshore Geothermal continuous circulation (NSD)



Location: Oman
Description: Onshore MPD and underbalance cementing (NSD)



Location: Egypt
Description: Offshore continuous circulation (NSD)



Location: Netherlands
Description: Onshore continuous circulation (NSD)



Location: Japan
Description: Offshore continuous circulation (NSD)



Location: Norway
Description: Technology development continuous circulation



Location: Major Onshore Markets
Description: NSD and TCD licensing agreement

HALLIBURTON

Location: SAE Indonesia & Netherlands
Description: Onshore Geothermal continuous circulation (NSD)



Location: SAE Indonesia
Description: Onshore Geothermal continuous circulation (NSD)



Location: Egypt and Malaysia
Description: Offshore continuous circulation (NSD)

Recent Technical Paper



Case History of using Continuous Circulation with Air/Foam - Improving Operational Efficiencies - 10 Years of Drilling Optimization
October 2019, IADC Wells Technology Conference & Exhibition, Kuala Lumpur, Malaysia

To discover more about the advantages of Non-Stop Driller, contact your authorized Adrilltech representative or email your inquiries to info@adrilltech.com

www.adrilltech.com