

Dopeless[®] technology

Quantifying operational,
well productivity and HSE benefits

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Advantages throughout the tubular lifecycle

WHAT IS DOPELESS® TECHNOLOGY?

Dopeless® technology is a dry, multifunctional coating applied to TenarisHydril premium connections in the mill, making thread compounds obsolete. By doing so, Dopeless® coating makes operations more efficient, lessening the environmental footprint and minimizing risk and costs for E&P operators.

Dopeless® coating is applied in a fully automatic process in the controlled industrial environment of Tenaris mills. The process guarantees that the exact amount of lubricant is applied to each connection. In standard E&P operations, thread compounds are applied manually in the field with a brush.

Tenaris is currently expanding Dopeless® production capacity to satisfy growing demand and maintain its position as the leader in the provision of dope-free technology.

Our Dopeless® production lines are located in Argentina, Mexico, Indonesia, Italy, Romania and the USA. Additionally, ten self-contained Dopeless® technology units have been deployed worldwide, capable of preparing accessories and repairing pipes.

Dopeless® technology brings quantifiable benefits to E&P operations:

Zero discharge and minimal risk

HSE performance

Without thread compounds the rig site is cleaner and safer while significantly decreasing the operation's environmental footprint.

Nearly 0 re-makeups and rejects

Reliability

Dopeless® products reduce the risk of make-up problems, increasing the reliability of the installation. Typical re-makeups (2.5% of connections) and rejects (1.5% of connections) are significantly reduced.

10% savings on total pipe cost

Offshore savings

As a rule of thumb in offshore operations, based on customer experience, a well with 100% Dopeless® casing and tubing will produce a 10% savings of the total pipe cost due to increased rig time efficiency.

Running times reduced up to 25%

Time

According to customers' experience with Dopeless® technology, running time can be reduced up to 25%.

BENEFITS FOR ALL OPERATIONAL ENVIRONMENTS

Dopeless® connections are field proven in the following field conditions:

- Offshore
- Arctic
- Desert
- Jungle
- Shales and other unconventional resources
- Mature fields

PRODUCT AVAILABILITY

Dopeless® technology is available for the following TenarisHydril premium connections:

- Blue® Series
- Wedge Series 500™
- Wedge Series 600™
- ER™

All products are fully interchangeable with the standard version of the same connection and available in the complete range of casing and tubing dimensions and materials.



Dopeless® technology is non-sticky, minimizing contamination caused by sand or debris in dusty or desert areas.

EXCELLENT PERFORMANCE IN AN ARCTIC SUBSEA FIELD



Operator/customer
Statoil

Field type
Snøhvit (offshore)

Location
Barents Sea, Norway

Type of well
Gas

Reason for using Dopeless® technology HSE performance

“Less operations on the pipe leads to lower potential for injuries. No doping on the rig floor.”
(Statoil Well Informed Magazine, December 2004)

Subsea wells

The cost and complexity of having to perform workover operations on these gas wells made product reliability a top priority.

Zero discharge

Compliance with strict environmental regulations on the use of potentially toxic chemicals.

Arctic environment

Dope freezes in sub-zero temperatures, making pipe preparation and running difficult.

Benefits observed

Since all casing and tubing strings were run in 10 wells made up with Dopeless® connections, the customer successfully met the zero-discharge target.

More than 5 years
of ongoing reliability
Dopeless® connections used in the Snøhvit project continue to perform flawlessly, even after more than five years in the seabed.

Improved operational performance



Dopeless® connections yield positive results for casing and tubing operations in a number of ways.

Increased efficiency

Since the connection make-up process is safer and more stable due to the robust performance of Dopeless® technology, downtime problems introduced by make-up inconsistencies are significantly reduced. This results in a faster installation of the string with time savings in the order of 25%.

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With Dopeless® technology, operational problems are reduced, making running significantly faster.

SIGNIFICANT SAVINGS



Calculating savings with Dopeless® connections

Having drilled dozens of wells using Dopeless® connections in its E&P operations since 2003, a Tenaris customer has been able to precisely quantify the amount of savings that the technology can bring to each new well.

30-120K

savings per well
in USD

Reduced time and costs

By computing the number of hours and minutes saved in individual casing and tubing running jobs as a direct consequence of the virtual elimination of re-make ups and rejects that Dopeless® connections generate, the company can calculate savings in rig time use.

Even after paying an extra for pipes incorporating Dopeless® technology, the operator is able to achieve savings of between 30,000 USD and 120,000 USD per well depending on the type of rig (platform, jack-up, high efficiency jack-up).

FASTER RUNNING IN SIBERIA



Location
Eastern Siberia,
Russian Federation

Type of well
Onshore oil and gas

Reason for using Dopeless® technology

Arctic environment

Dope freezes in sub-zero temperatures, making pipe preparation and running difficult.

Large development

The number of wells made operational efficiency a priority.

Benefits observed

Faster and safer preparation and running

Dopeless® technology renders thread compounds superfluous making operations simpler and cleaner.

Average running speeds

- Doped connections: 11 joints/hour
- Dopeless® connections: 14 joints/hour
- Zero rejects in all jobs
- More than 9,310 tons (788,600 feet) of pipes installed in 73 wells

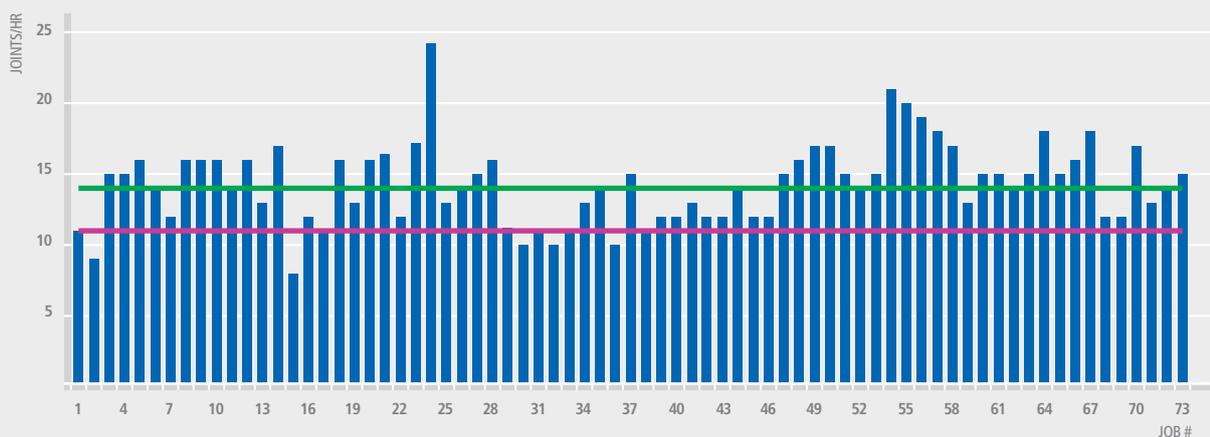
More than
25%

Running time
gains

Running speeds: Standard Connections vs. Dopeless® Connections

7" 26# L80 TENARISHYDRIL BLUE® DOPELESS® CONNECTIONS

■ DOPELESS® TECHNOLOGY SPEED PER JOB ■ AVG. RUNNING SPEED WITH DOPELESS® TECHNOLOGY ■ AVG. RUNNING SPEED WITH DOPE





Location

Conklin, Alberta, Canada

Type of well

Steam-Assisted Gravity Drainage

Reason for using Dopeless® technology
Arctic environment

Dope freezes in sub-zero temperatures, making pipe preparation and running difficult.

Pad drilling

In an effort to reduce drilling times and costs in a pad-drilling project, the operator sought to streamline processes and eliminate unnecessary steps in the process flow.

Benefits observed

Time savings

After running 36 casing strings with TenarisHydril Blue® Thermal Liner Dopeless® connections, the company noted that the dope-free coating increased running speeds by almost 10% (24 joints/hour).

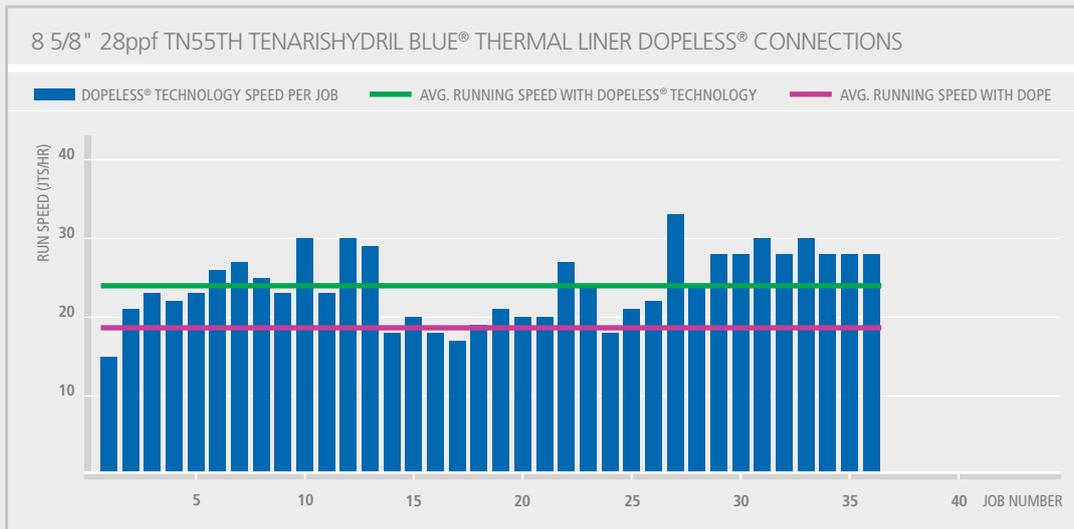
- Of the 1,274 joints run, there was only one reject
- 1% re-reruns vs. 3% with standard connections

More than **3,000** USD per string

Nearly **55,000** USD per pad

10% Running time gains (24 joints/hour)

Running speeds: Standard Connections vs. Dopeless® Connections



FASTER RUNNING IN AN EXTENDED REACH WELL



Location

Abu Dhabi (UAE) Offshore

Type of well

Extended reach drilling – horizontal section surpassing 10,000 feet

Reason for using Dopeless® technology
Increased efficiency

The horizontal wells required the strength of integral Wedge Series 500™ connections, opting for 6 5/8" 24# L80 Wedge 521™ Dopeless® connections. Dopeless® technology was chosen due to its operational benefits and reliability.

Benefits observed

Average running speeds

- Doped connections: 10.65 joints/hour
- Dopeless® technology: 14.47 joints/hour

More than **35%** Running time gains

Following the trial, Wedge 521™ Dopeless® connections became the standard for offshore operations.

Reliability

The reliability of tubular installations is heavily dependent on the quality of connection make-up. Standard practice involves the application of thread compounds manually with a brush. Applying too much (overdoping) or too little (underdoping) thread compound can hinder the overall performance of the connections. The quality of the thread compound is difficult to control in the field.

Since Dopeless® coating is applied directly to the metallic surface of each connection in a controlled industrial process, each thread comes with the exact amount of lubricant evenly distributed throughout its metallic surface and intimately adhered to it. As a result, make-up operations become more consistent, more uniform and their behavior more reliable, thus guaranteeing the connection's performance.

If several make-and-breaks are necessary, Dopeless® connections provide consistent performance. The coating withstands these operations without the need to apply thread compounds.

FLAWLESS PERFORMANCE IN PULLING OPERATION



Extreme reliability with chrome tubing

In October 2011, a Tenaris customer successfully installed the upper completion of a first well drilled at an oilfield in the North Sea. The 5 ½" tubing was assembled with 284 joints manufactured on 13% chromium steel grade and featuring TenarisHydril Blue® Dopeless® connections.

Over 50K
USD savings in
repairs

Zero rejects

After around 250 joints had been run, the signal from the downhole gauges was lost. This forced the operator to pull the entire string out of the hole to replace the gauges and rerun the tubing. Inspection of the pipes retrieved from the first run showed that Dopeless® coating had fully protected every single connection from sustaining galling damage – resulting in no rejects due to galling after two make-ups and one break-out.

For every rejected 13 Cr joint unable to be field repaired, the customer would have had to spend approximately 2,000 USD to replace the coupling, rethread the pin end and buck on the new coupling. If 10% of connections had been rejected – something common in similar operations using environmentally-friendly running compounds on CRA materials – repair costs would have amounted to over 50,000 USD.

ZERO GALLING AND DAMAGE



Location
Norway

Type of well
Oil and gas

Field type
Offshore

Reason for using Dopeless® technology

The operator noted the strength of Dopeless® connections in complex offshore wells as well as better downhole operations.

Benefits observed

Increased reliability

After running a 5 ½" liner string made up with Blue® Dopeless® connections to target depth, the company needed to pull back the string due to operational problems, which was preventing the tubing from reaching required depth. In many pulling operations, casing and tubing strings suffer damage that cannot be field repaired, warranting costly and time-consuming full rethreading operations.

- Not a single dry connection sustained any damage during either make-up or break-out
- Quick turn around of the string (no need to apply dope)
- 0 rejects

200,000

Total savings (USD)
(the amount takes into consideration coupling replacement and rethreading of pin ends)

DOPELESS® TECHNOLOGY SAVES BIG TIME IN PATAGONIA



Operator/customer
Petrobras Argentina

Field type
Onshore

Location
Neuquén Basin,
Argentina

Type of well
Gas

Reason for using Dopeless® technology

Efficiency and reliability

The operator wanted to test the reliability benefits of the dry technology in a project using 13%Cr pipes to withstand CO₂ corrosion.

Benefits observed

- Average running speed for TenarisHydril Blue® Dopeless® connections: 20 joints/hour
- 0 rejects and 0 re-runs
- Compared with the standard version of the same connection, this represented a total rig time reduction of nearly 30%

Nearly 30%

Rig time reduction

Other operational benefits

LESS PIPE HANDLING

With Dopeless® technology, pipes arrive rig-ready, avoiding the need to transport the materials to cleaning or preparation areas for dope replacement before delivery to the rig.

REDUCED CONNECTION REPAIRS

This value reflects the cost associated to re-cut the joints damaged during a conventional run (with dope).

PREPARATION FOR OFFSHORE (PFO)

By simplifying handling and installation procedures, less manpower is required.



Customers evaluate the benefits of Dopeless® technology first hand during a rig demonstration.

Improved well productivity



Once the well enters production, having Dopeless® technology brings additional benefits in terms of well productivity. This arises from the elimination of excess chemicals in the well bore, created by thread compounds during the assembly process.

MINIMIZE FORMATION DAMAGE

Formation damage can have a critical impact on well productivity. In overdoled tubing strings, the excess lubricant can invade and plug a porous formation, significantly reducing permeability and blocking flow paths.

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Dopeless® technology avoids well bore contamination.

FORMATION DAMAGE, A THING OF THE PAST



Location
Middle East

Type of well
Exploration

Field type
Onshore

Reason for using Dopeless® technology

Avoid formation damage

While exploiting a gas carbonate reservoir, the customer experienced formation damage caused by excess dope at each well in the field. A series of remedial operations were required to address the issue.

Benefits observed

After deciding to replace the workstring with TenarisHydril Blue® Dopeless® connections:

- All dope-induced formation damage issues disappeared
- No further remedial operations were needed

**Around
100,000**
USD per well
Total savings

Tenaris, in conjunction with Tecpetrol, is studying the effect that dope applied to casing and tubing during well completion has on the permeability of the formation, evaluating possible damage and quantifying it when possible. The results of the study will be presented at the ARPEL (Asociación Regional de Empresas del Sector Petróleo, Gas y Biocombustibles en Latinoamérica y el Caribe)-IAPG (Instituto Argentino del Petróleo y del Gas) technical congress in Argentina during August 2012.

BETTER DOWNHOLE OPERATIONS

Dopeless® connections eliminate any contamination with thread compounds in the tubing/liner. This simplifies and enables downhole operations, e.g. wireline, tractor tools and coiled tubing applications.



Proven benefits

Tenaris customers have noted the following positive impacts on productivity during a recent customer demonstration event:

- Improved downhole operations: especially wireline in dual completion wells
- Minimization of sand screen clogging: typical in gas production applications
- Reduced mud contamination avoided: this is caused by the excess of threading compounds during make-up. Dopeless® technology eliminates the possibility of drilling fluid contamination



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If overdoping occurs, the compound can plug the formation, reducing permeability.

HSE benefits

HEALTH AND SAFETY

Cleaner, safer workplaces

Pipe storage and running compounds spilt on yards and rig floors create slippery surfaces that could increase the risk of accidents. Slippery floors are almost unavoidable when using doped connections, since the process of cleaning them is frequently carried out with the aid of high-pressure water jets, solvents and soaps that have no other place to go but down. Applying running compounds during make-up creates similar safety concerns on the rig.

By completely eliminating the need to both apply and remove wet-based compounds, Dopeless® connections help maintain working surfaces clean, dry and non-slippery, greatly reducing the chance of accidents.

Less pipe handling

Whenever pipe is lifted, lowered or moved sideways in an area shared by workers, there is a heightened risk of incidents and accidents. By reducing both pipe handling operations and manpower, Dopeless® technology further enhances personnel safety.

Statoil noted these benefits when Dopeless® technology was chosen for the Snøhvit project: “Less operations on the pipe leads to lower potential for injuries. No doping on the rig floor.” (Statoil Well Informed Magazine, December 2004) For more information about the Snøhvit project, see the case on page 5.

ENVIRONMENT

Zero discharge

A report carried out by Det Norske Veritas (DNV) found that, at the moment, there is no known better way to reduce the environmental footprint of casing and tubing running operations than by not releasing any thread compounds at all. The findings certify that Dopeless® technology is zero-discharge, eliminating the need for discharge permits that operators generally need to acquire for their operations.

Protector recycling

With Dopeless® technology, the plastic thread protectors are already clean, dry and ready to be recycled or reused after pipe installation.

Minimizing environmental impact

Tenaris currently participates in the Environmentally Friendly Drilling (EFD) program. Led by the Houston Advanced Research Center (HARC), the project’s objective is to identify, develop and test innovative technologies that reduce the environmental impact of oil and gas activities in sensitive areas which have not yet been opened up for development. Dopeless® technology has been adopted in HARC’s portfolio of recommended products in the framework of the EFD initiative.

FIRST ECO-WELL IN THE PERUVIAN JUNGLE



Operator/customer
Repsol

Field type
Amazon jungle
(onshore)

Location
Ucayali-Madre de
Dios basin (Peru)

Type of well
Gas

Reason for using Dopeless® technology Environmental protection

The operation took place in a sensitive habitat, home to numerous indigenous communities and rich biodiversity. In this setting there was a need to avoid releasing potentially hazardous chemicals while cleaning, making up or breaking out pipe.

Benefits observed

- First eco-well in a jungle environment to have all casing, liner and tubing strings made up with Dopeless® connections
- No storage or running compounds used
- No fresh water or chemicals needed to clean up connections prior to installation

Zero

Environmental
impact caused by
dope discharges



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Dopeless® technology makes operations cleaner and safer by avoiding the need for thread compounds.

The logo for TenarisHydril, featuring a stylized icon of four horizontal bars on the left, followed by the text "TenarisHydril" in a white sans-serif font.

For additional information, please visit
www.tenaris.com/dopelesstechnology



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