

PRODUCT BROCHURE

# DRILLING

**Huisman**  
Equipped for impact

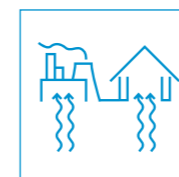
# DRILLING



Huisman Innovation Tower

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# Equipped for impact



We are Huisman. We design, manufacture and service heavy construction equipment for the world's leading companies in the renewable energy, oil and gas, civil, naval and entertainment markets. Our products range from Cranes, Pipelay Equipment, Drilling Equipment and Winches, to Vessel Designs and Specials.

The history of Huisman is one of setting new industry standards. Of making impact, since 1929. With step changing technical solutions that vary from stand-alone to highly engineered integrated systems. From concept to installation and lifetime support.

In these times of transition, our passionate workforce and worldwide production, service & sales facilities make us equipped for impact.

## Active in 6 Markets



Oil and gas



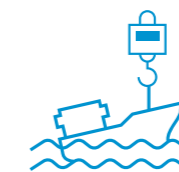
Offshore wind



Geothermal energy



Civil works



Salvage



Leisure

## People



2500+ employees worldwide

## Track record



Operating from 7 locations



203 vessels are equipped with our products

# DRILLING

## GENERAL INTRODUCTION

Huisman has been designing and building equipment for the offshore drilling market for over 20 years. Initially Huisman delivered cranes and pipe handling equipment, but with the development of the Multi Purpose Tower (MPT) in the late 90's, Huisman has created the means to drastically reinvent offshore drilling and equipment handling. What started off with the delivery of riser and pipe handling equipment, has evolved into the design and delivery of two state of the art UDW drilling vessels, the 'Noble Globetrotter I' (2012) and the 'Noble Globetrotter II' (2013). After delivery of these vessels, Huisman further developed the design, demonstrated at the Huisman Innovation Tower, a 90m high test drill tower at the Huisman Schiedam quayside.

In 2005 Huisman introduced its first land drilling rig to the market: the LOC 250. This is a fully containerised super single drilling rig for use on land and offshore. The introduction was soon followed by the LOC 400. A new range of land rigs has been developed in close cooperation with the market, outperforming peers on rig move and pipe running speeds. These rigs combine performance with automated hands free pipe handling.

In addition to on- and offshore drilling, Huisman also supplies equipment for the well intervention market. With the ever increasing number of subsea wells the need for efficient means of well intervention is growing every day. Huisman has already delivered several well intervention systems.

Huisman is continuously exploring and realising new step changing solutions to improve drilling operations. The Huisman drilling systems can reduce the flat time, by doubling the tripping speed. Moving forward, the focus point is to further improve efficiency and reduce HSE risks, by fully automating the drilling system. Currently the rigs are already able to trip in and out of the hole fully automated, without the need of any people on the drill floor.

2x 1,090mt Dual Multi Purpose Towers,  
Noble Globetrotter I, Noble Drilling



## MULTI PURPOSE TOWER

One of the most distinct features of the Huisman drilling systems is the Multi Purpose Tower (MPT). The concept of the MPT is based on the use of a vertical box structure instead of the traditional lattice structure typically applied for derricks. The box structure provides both the main load carrying element and an enclosed environment for the mounting of all major equipment.

The MPT has the same functionality as a normal derrick, but offers improved accessibility to the well centres, which allows for new improved handling procedures that increase efficiency and safety. The MPT was designed and introduced to the market in the late 90's. This first MPT was installed in 2001 on the Helix well intervention vessel Q4000.

Over the years the MPT has evolved through several stages into the 2.4mIn lbs Dual Multi Purpose Tower (DMPT) that is featured on the UDW drilling vessels Noble Globetrotter I and II

operated by Noble Drilling. In new designs the capacity can be increased to 3.6mIn lbs.

### LAYOUT

The DMPT has two hoist sides; the main hoist side above the drill floor and the construction hoist side above the construction floor. With the two hoists many of the drilling activities can be performed simultaneously, which increases efficiency. The main hoist provides direct access to the drill floor and is used for drilling operations. The construction hoist is generally only used for heavy offline activities. Both hoist sides have their own independent hoist systems.

The DMPT is equipped with two circular setback drums for vertical pipe storage. Each drum revolves around its centre column to provide access to all pipe slots. The revolving setback drums are mounted directly next to the DMPT. To transport pipes vertically from the setback drums to the well

center the DMPT is equipped with a pipe racker system consisting of up to 16 manipulators. On each corner of the DMPT up to 4 manipulators are mounted between the well center and the setback drum. The manipulators can be utilised to transport pipes vertically from the setback drum to the well center (and back). It moves up and down by rack and pinion and can rotate and extend to the well center or setback drum.

The equipment is located inside the MPT, offering good protection from the harsh marine environment. It also provides a safe environment for maintenance.

### HOIST SYSTEM

The hoist system of the MPT is fully enclosed by the tower. It has active and passive heave compensation and is equipped with dual drum drawworks and splittable blocks to increase redundancy and efficiency.

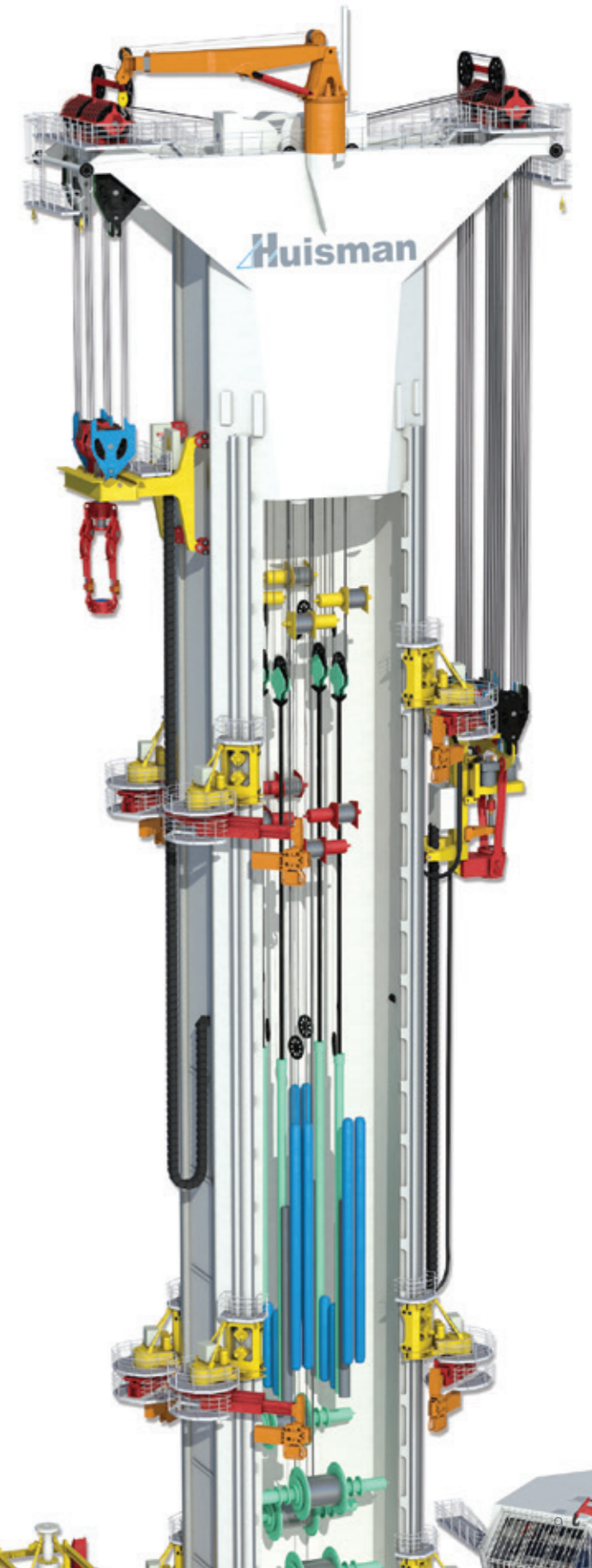
### Dual drum drawworks

The dual drum drawworks comprise two hoist winches each holding one end of the drill line. The drill line is reeved from one drum, over the passive heave cylinders, through the crown and travelling block, and onto the second drum. This configuration reduces the overall line speed with a factor two and provides full redundancy; if one winch fails the other winch can still operate the travelling block at full load, but at half the original speed.

To reduce wire fatigue, the complete drilling line can be transferred continuously from one drum to the other, exposing a different part of the wire to a fatigue sensitive location (e.g. a sheave). This continuous wire transfer can be pre-set by the operator and won't affect normal operations.

### Splittable blocks

The travelling block is equipped with Huisman's patented splittable travelling block. This splittable block comprises a number of detachable sheaves which allow the reeving of the block to be changed without having to re-reeve the entire system. Splitting of the blocks is a push button operation and allows the operator to switch from 24 to 20, 16, 12, 8 or 4 falls in just minutes. Splitting the blocks from 24 to 4 falls reduces the hoist capacity, but increases the hoist speed with 600%.



## MULTI PURPOSE TOWER

### HEAVE COMPENSATION

#### Active heave compensation

The active heave compensation system was developed from existing and proven technology fitted on many Huisman cranes and other Huisman equipment. The active heave compensation is achieved through the automated control of the electrical motors of the drawworks. The vessel motions are measured by a Motion Reference Unit (MRU) and sent to the control system of the fast response winch drives. The use of a real time signal means that the system does not have to rely on any wave or motion prediction method.

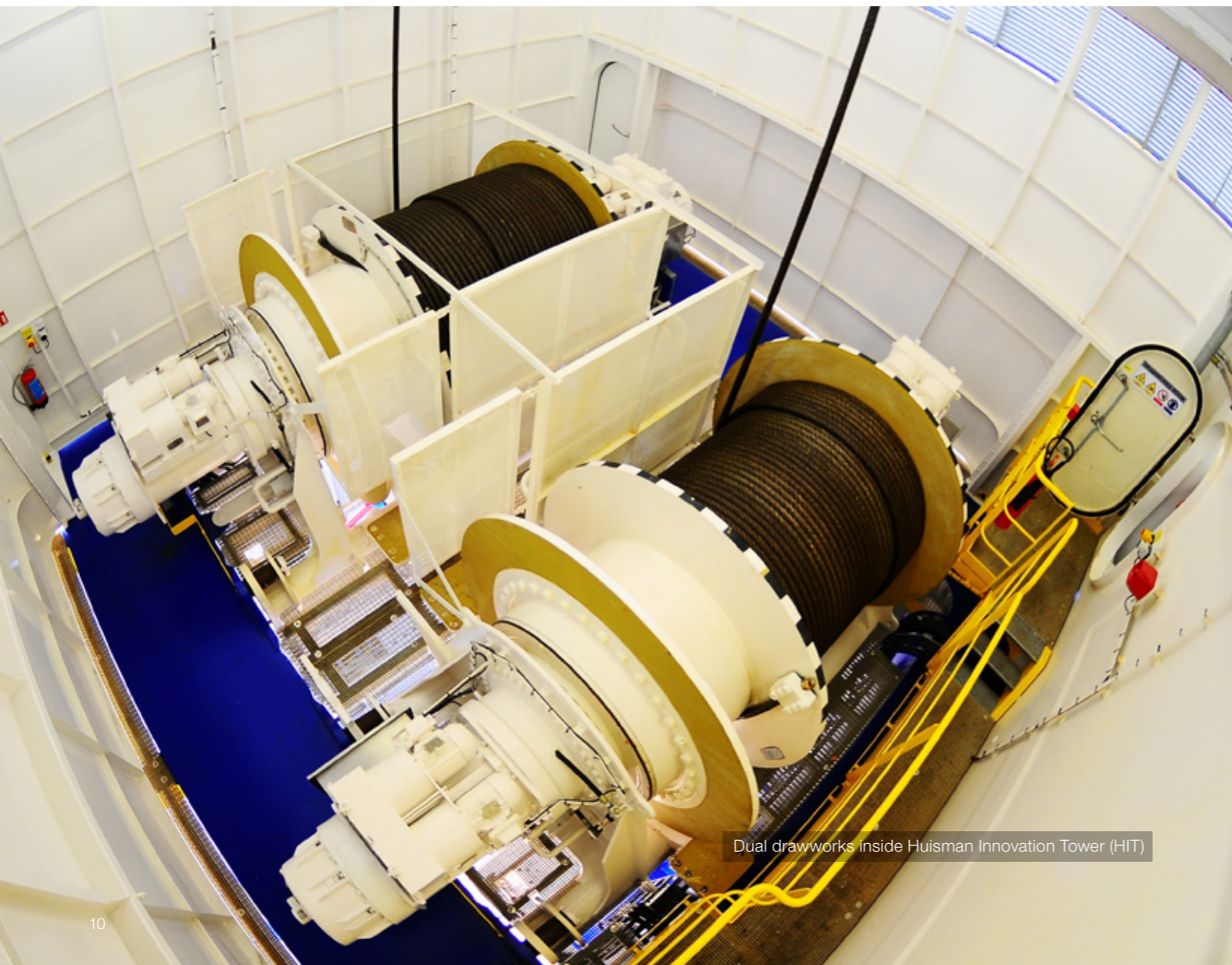
#### Passive heave compensation

The passive heave compensation system provides the control needed for extended periods of operation. The system balances the weight of the drill string, allowing for the heave of the vessel. The passive heave compensation is done by two hydraulic cylinders that are integrated in the hoist system. These hydraulic cylinders are pressurised by nitrogen pressure vessels. The wire from the drawworks is spooled over sheaves on the cylinders, whereby the cylinders act as springs. When the vessel moves up or down the cylinders keep the wire under tension, thereby compensating the vessel motions. The nitrogen pressure vessels that provide the back pressure for the cylinders are located inside the tower.

### INSTALLATION AND COMMISSIONING

Since the DMPT is a single integrated unit that houses all equipment, the interface with the vessel is greatly simplified. In combination with the Huisman substructure, that houses the complete drill floor, drilling switch board, HPU, control cabin and riser tensioners, the DMPT can be fully tested and commissioned on our quayside.

After the testing and commissioning phase the DMPT can be installed with one single lift onto the vessel, significantly reducing the time that the vessel has to stay at the quayside. This integrated approach allows for simultaneous production of the equipment at Huisman and the vessel at the shipyard. It also reduces the number and complexity of the interfaces between the vessel and the equipment, which reduces the installation and commissioning time.



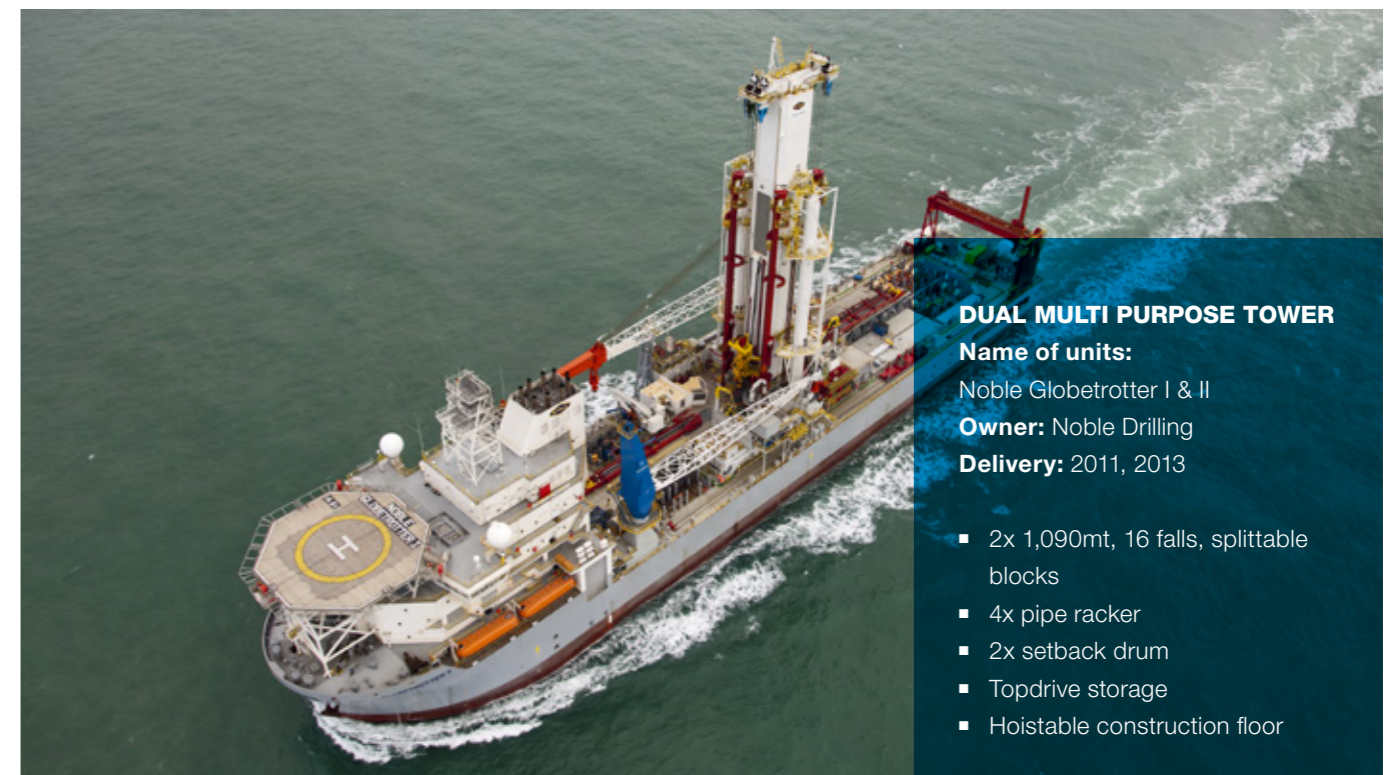
Dual drawworks inside Huisman Innovation Tower (HIT)

### FEATURES DUAL MULTI PURPOSE TOWER

- Box girder structure
- Free access to drill floor(s) (no V-door)
- Dual activity
- Dual active heave compensated winches
- Dual passive heave compensated cylinders
- Splittable blocks
- No slip and cut
- Single lift installation
- Small footprint
- Low center of gravity
- Equipment inside MPT



## MULTI PURPOSE TOWER



# DRILLING

## HUISMAN INNOVATION TOWER

The Huisman Innovation Tower (HIT) is a 90m high drill tower, capable of handling 55m (180ft) stands and 46m (150ft) riser and with the ability to simulate dynamical vessel movements. The HIT is located at the Huisman Schiedam quayside.

**PURPOSE:**

- Demonstration of equipment
- Full scale testing including dynamics
- Testing of automation / robotics
- Training of operators
- Pre-commissioning of equipment
- Development of future equipment
- Load testing of parts
- Future downhole testing



**FEATURES HUISMAN INNOVATION TOWER**

- Robotic autotripping at 5600 ft/hr
- 3.6mIn lbs (1,630mt) rated load
- Dual draw works / splittable blocks
- Active / passive heave compensation systems
- Up to 180ft stands
- Full scale setback drum
- Up to 8 multi purpose manipulators
- Open drill floor construction to allow installation of several types of rotary tables and / or hang-off equipment
- Drill floor 6m above ground level
- Total height approximately 88m
- Test well:
  - Ø 118" down to 50m
  - Ø 20" down to 400m





## OFFSHORE DRILLING



Huisman offers complete drilling packages and is dedicated to explore and realise new solutions to improve drilling operations. Our projects are typically complex and innovative, requiring solution-aimed thinking, technical excellence and partnerships with our clients. This has already resulted in a number of new value-adding solutions and orders for innovative and technically challenging drilling equipment sets.

### DRILLSHIPS

Huisman has in-house vessel design capabilities. This allows us to provide solutions in which vessel and equipment are fully integrated. The main feature of Huisman's drillship design is the Dual Multi Purpose Tower (DMPT) and the reduced height of the drill floor. By changing the way the BOP is deployed Huisman was able to significantly lower the position of the DMPT and drill floor on the vessel.

This improved the vessel stability and increased the efficiency and safety on board. Designing both vessel and equipment allows for optimisation of the entire drilling unit. The result is a more compact drilling vessel compared to drillships with equal capacities and, therefore, lower building costs and lower operational costs.

2x 1,090mt Dual Multi Purpose Towers,  
Noble Globetrotter I, Noble Drilling

## OFFSHORE DRILLING

### BULLY DRILLSHIPS

In the first half of 2007 Huisman was awarded a contract for the design and manufacturing of the drilling tower and related pipe, riser and BOP handling equipment for the Noble Bully I. The order for the outfitting of a second vessel followed in 2008. In 2013 and 2014 Bully I & II respectively were awarded 'Shell floater rig of the year'. The Noble Bully drillships are designed to offer a lower cost and more flexible alternative for drilling in ultra-deep and arctic conditions.

Besides the drilling mast, Huisman also delivered all drill pipe handling equipment, the riser tensioning system, the riser handling cranes, both deck cranes and the driller's cabin. This includes all power systems and an integrated control system, which also controls third party equipment.

### GLOBETROTTER DRILLSHIPS

The innovative Noble Globetrotter drillships, based on a Huisman design, represent a true stepchange in the construction of ultra-deep water drillships. The vessels offer improved operational efficiency due to the different equipment layout. Designing both vessel and equipment allows for optimisation of the entire drilling unit. The result is a more compact drilling vessel.

The design is possible because of three radically different features, namely: a DMPT, a hoistable floor and the engine rooms under the accommodation. The DMPT has no V-door limitations and a small footprint. It is possible to skid the BOP underneath the floor when it is hoisted and then lowered on the construction side. The BOP is then skidded from the aft to the forward well center by means of a skid cart that moves along the moon pool under the substructure.

### HUISDRILL 12000

After the delivery of the two Noble Globetrotter vessels Huisman further developed the design. This resulted in the HuisDrill 12000. The HuisDrill 12000, as designed with Huisman's DMPT technology and unique construction methodologies, exceeds many of the capabilities of competing drillship designs. The Huisman approach results in several functional and operational advantages.

The vessel has a large unobstructed work deck forward and aft of the tower that is flush with the drill floor. All ventilation, mooring, access ladders and mob-boats are located below this work deck. The vessel is equipped with 150ft risers minimising the time for running risers. Aft of the tower is a unique movable construction floor which allows running of large subsea components in one piece.

The drilling unit is optimised as a whole. The design of the drilling package, the functionality thereof and the material

flows on board are a top priority. The design of the vessel is made to optimally accommodate the drilling process.

These changes in the design result in a vessel size that is 216m x 39m with a maximum VDL of 30,000mt. DWOPs have shown that the vessel can deliver wells in 75 - 80% of the time compared to other state of the art units.

#### FEATURES HUISDRILL 12000

- Compact vessel
- Dual Multi Purpose Tower
- Drill floor flush with deck
- Movable floor
- Riser storage in hull
- Automated pipe handling
- Riser tensioner system
- High payload / displacement ratio
- Engine rooms under accommodation block



# DRILLING

## OFFSHORE DRILLING

### SEMI-SUBMERSIBLES

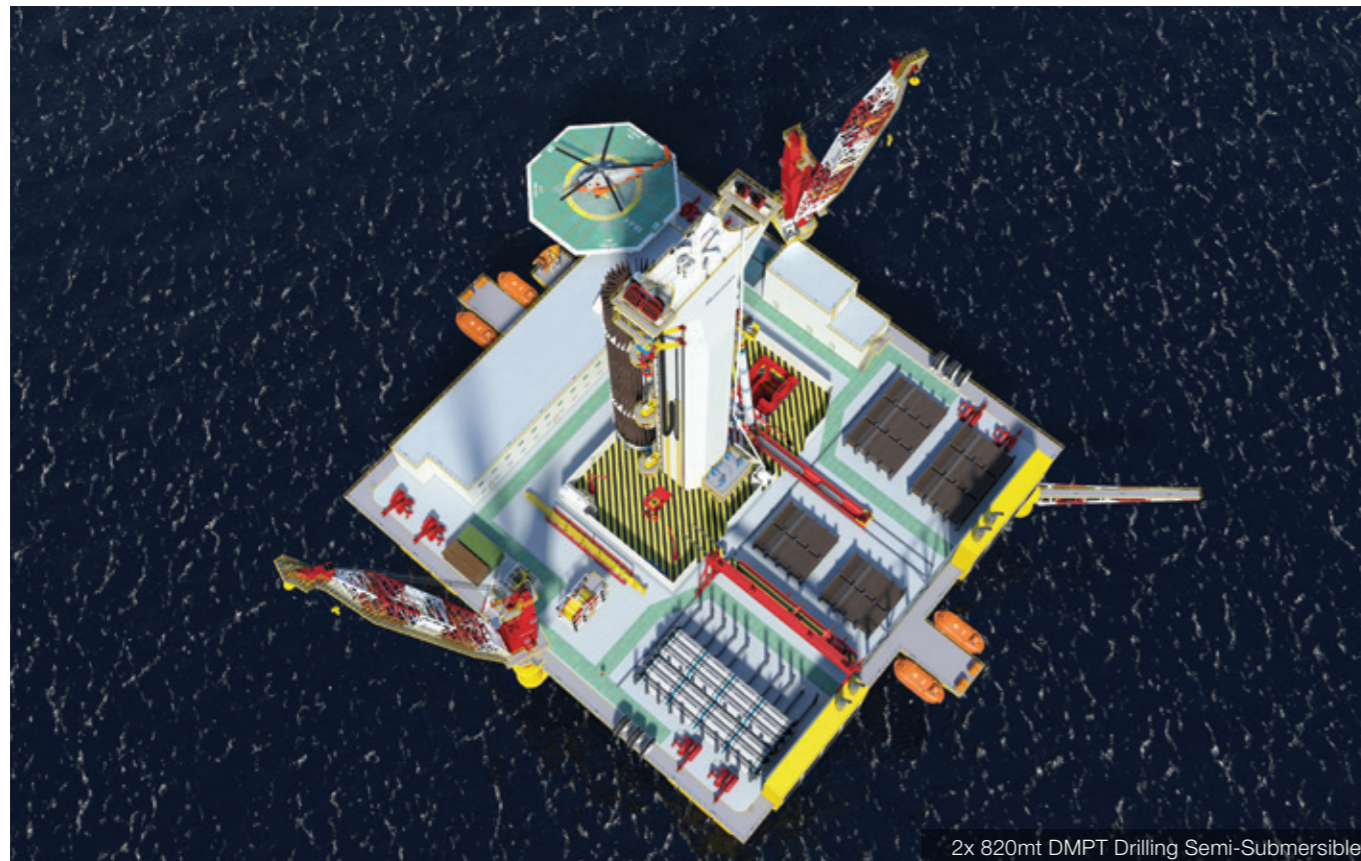
In the mid 90's Huisman was involved in the design of the Pride Amethyst 2 class semi-submersible drilling rig. The semi-submersible has a unique Huisman designed vertical riser storage. Four semi-submersible units were built according to the Huisman design, including Huisman built riser handling cranes and offshore cranes. The gained experience is continuously used in the design of complete drilling semi-submersibles.

The innovative harsh environment semi-submersible drilling unit features a very large free deck area, approximately 1,5 times the deck space available on other semi designs. There is no large accommodation superstructure since the accommodation is completely fitted inside the deck box. The robotic Multi Purpose Tower (MPT) outfitted with manipulators and setback drum is fitted on top of the deck box. On the aft deck of the unit an automated container skidding system is present, to enable full hands-off handling of containers with tubulars and other goods. This improves the safety of the rig and reduces the required people on board.

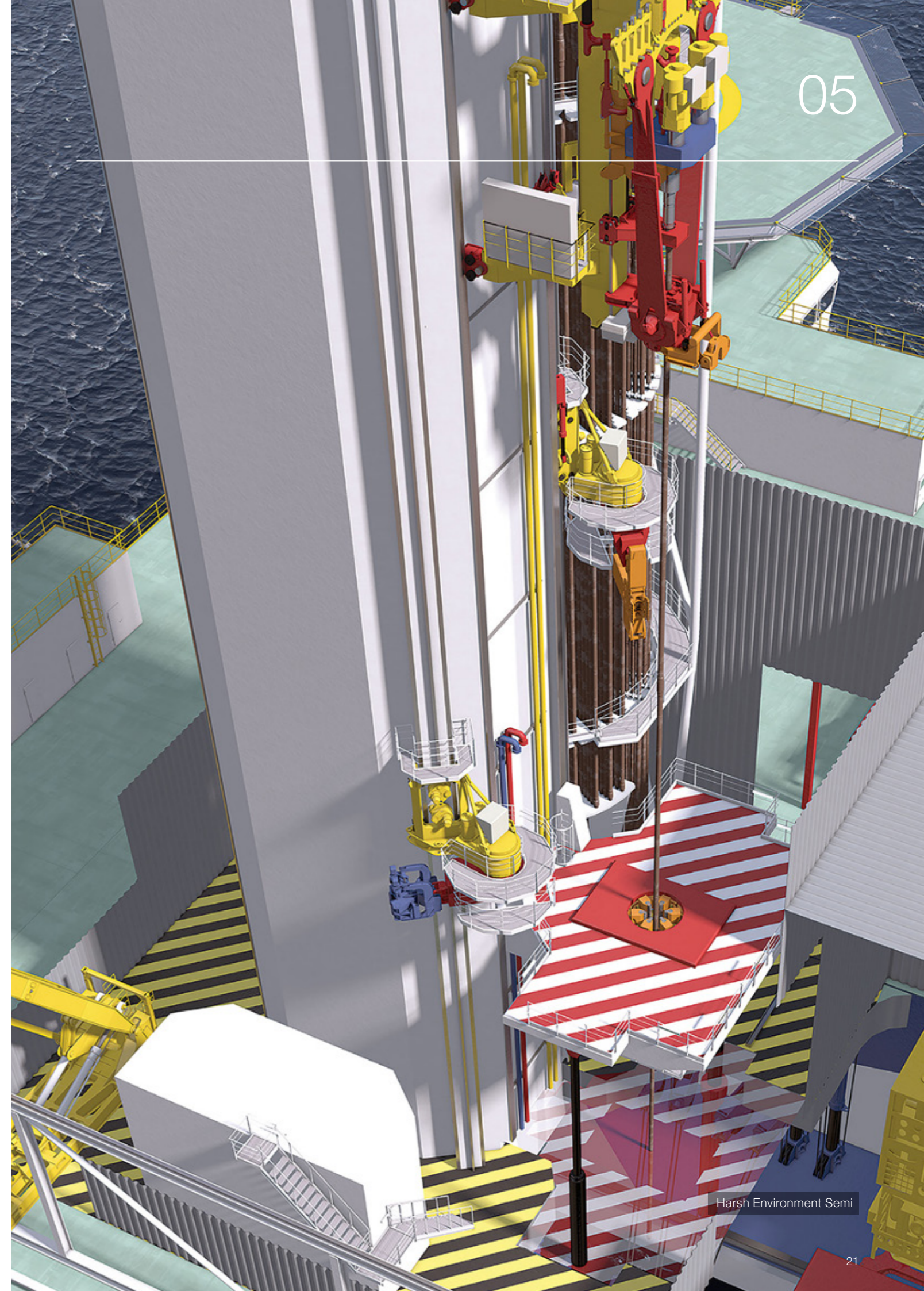
The drill floor, in the center of the rig, can be raised and lowered. In the lowest position the drill floor is flush with the main deck of the unit, enabling easy mobilising of equipment. When the floor is raised, the floor can compensate for the vessel's heave motion. The heave compensated floor enables that tubulars are always heave compensated (by either the heave compensated travelling block or the heave compensated floor). This significantly reduces downhole surge and swab pressures, enables MPD on floaters in heavy seas, enables running of completions with control lines in heavy seas and enables easier and faster coring.

Due to the MPT and the heave compensated floor, the handling procedure of the SSBOP and X-mas trees is changed resulting in a complete elimination of the substructure. This lowers the vertical center of gravity and increases the stability of the unit resulting in a high payload / displacement ratio.

The unit can be equipped with thrusters to have DP3 capability, an anchoring system or thruster assisted mooring.

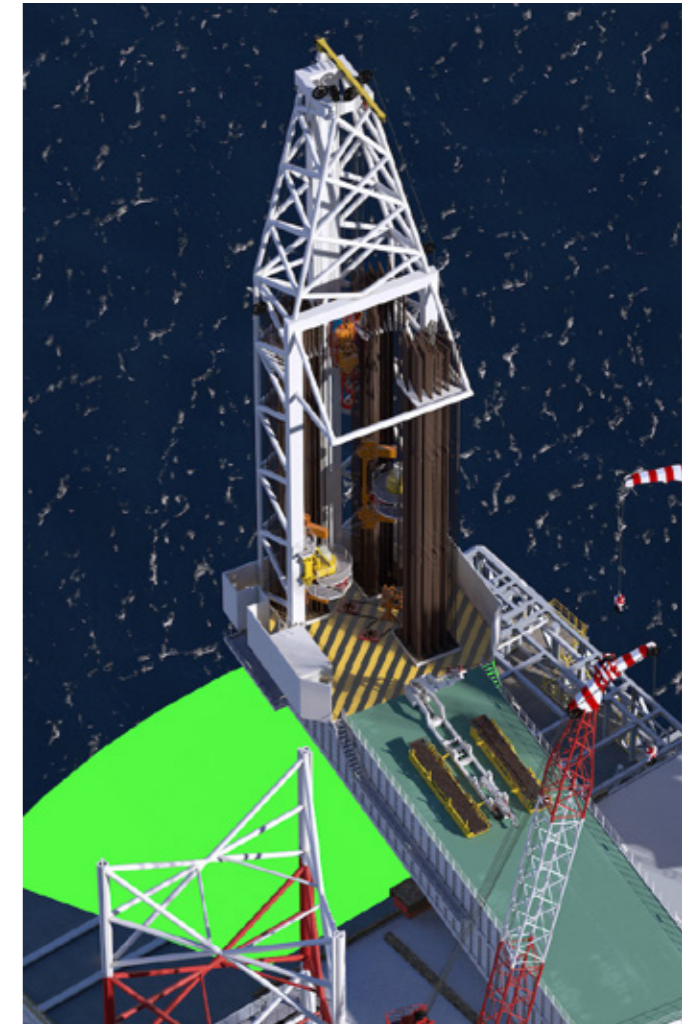
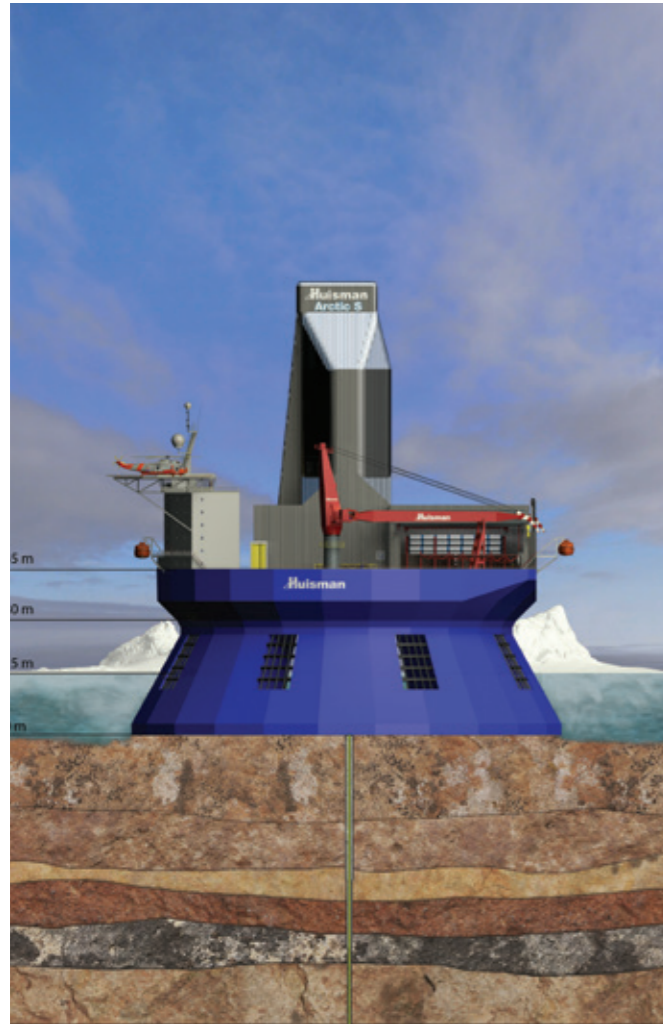


2x 820mt DMPT Drilling Semi-Submersible



Harsh Environment Semi

## OFFSHORE DRILLING



### ARCTIC S

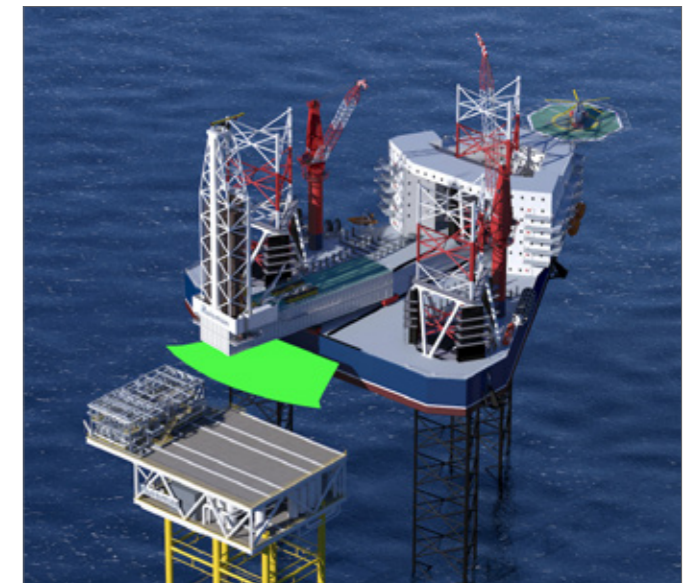
The Huisman designed Arctic S enables operations at two operating drafts. The unique design combines the advantages of a conventional semi-submersible resulting in very low motions in waves and a heavily strengthened ice resistant unit when operating in ice at deep draft.

The Arctic S drilling unit is designed to drill wells in arctic conditions, moored in ice infested waters with ice thickness up to approximately 1,0 - 1,5m. Depending on ice conditions, ice breaker support can be required. The unit consists of a round floater, eight columns and a round deckbox.

When operating in ice the unit will ballast to ice draft (partly submerged deckbox) to protect the riser against level ice, rubble and ice ridges. The round conical shaped deckbox has a heavily strengthened structure at waterline level to deflect and break the ice. The round floater is also strengthened for transit through broken ice (icebreaker assisted). When no ice is present the unit operates at its operating draft as a conventional semi-submersible unit. Station keeping in ice infested waters is achieved by a heavy 16-point mooring system. The unit can operate in water depths between 50 and 1,500m. If required the design can be customised to set the unit on the seabed in shallow water.

### ROTATING CANTILEVER

The Rotating Cantilever is designed for efficient operations. By rotating the cantilever as opposed to skidding it transversely, the cantilever has a large drilling envelope without sacrificing deck space. Especially the transversal reach has more than doubled with respect to all existing designs. It further eliminates the need for a transverse skidding substructure on top of the cantilever or transversal skid rails on the main deck. A variety of setups for the drilling equipment can be mounted on top of the cantilever, depending on the specific requirements. Features such as offline standbuilding, offline building and handling of X-mas trees, coiled tubing operations etc. can be incorporated.



## WELL INTERVENTION

Well intervention and workover operations are performed for maintenance purposes to keep production levels up, but also to get reservoir information and sometimes to change out entire X-mas trees. Well intervention operations represent a large portion of the total field development cost. Therefore reducing these cost significantly increases the field economics. Up until now, most of the intervention work has been performed by large expensive drillships and semi-submersibles. By performing the well interventions from specialised dedicated vessels, the workover cost can be significantly reduced and the HSE improved. In the industry there is a clear difference between 'open water' and 'riser based' intervention. Downhole tools may be lowered on slick or wireline to perform logging, plugging, perforating, etc. For riser based intervention a high pressure riser is used as a conduit between the seafloor and the vessel. Since the riser is high pressure, there is no telescopic joint and so the

surface equipment heaves up and down with respect to the deck. Downhole tools may be lowered through the riser on wireline, slick line or coiled tubing.

### GENERAL

To serve both the open water and the riser based well intervention markets, Huisman has developed two separate systems. Both systems are based on the Multi Purpose Tower (MPT) which is responsible for all vertical movement of the equipment on board. The MPT has the same functionality as a normal derrick, but offers improved accessibility to the well centers, which allows for new improved handling procedures that increase efficiency and safety. The superior accessibility to the well center and small footprint of the MPT are ideally suited for well intervention and subsea installation services. Subsea equipment can be skidded into the well center from three sides, giving the operator optimal flexibility.

### OPEN WATER SYSTEM

The Huisman open water intervention system is based on a 150mt single fall MPT that provides a single lift point over a moonpool. The tower's heave compensated hoist system can safely deploy modules to water depths up to 3,000m. Two trolleys, travelling the entire length of the tower, guide the lifting hook and the subsea modules during lifting operations. Depending on the vessel design, the lower trolley can travel all the way down into the moonpool to the vessel base to safely deploy subsea equipment through the moonpool.

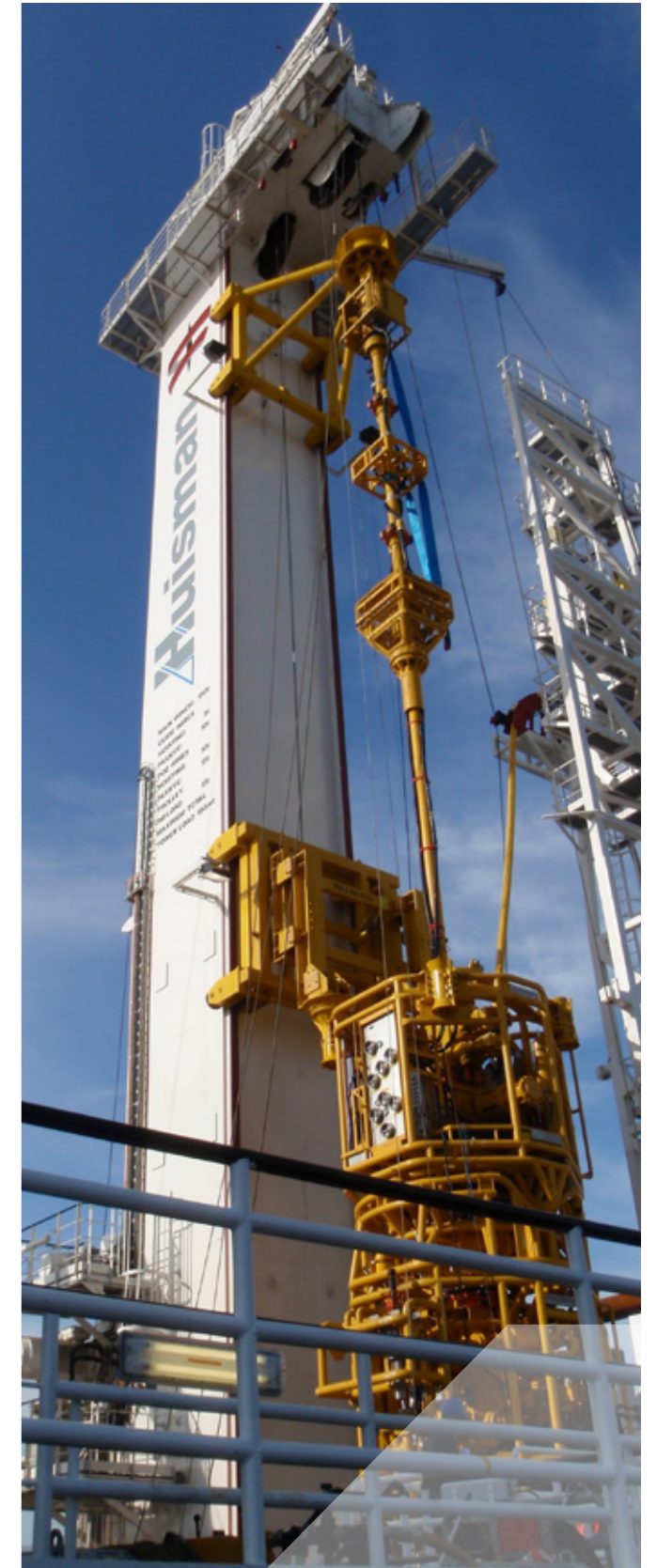
Typical applications for the open water system include:

- Wire line and slick line services
- X-mas tree installation
- Plug and abandonment
- Subsea deployment



### FEATURES OPEN WATER SYSTEM

- Multi Purpose Tower – SWL 150mt
- Active and passive heave compensation
- Deployment capability of up to 3,000m
- Guide and pod wire system
- Guide trolleys
- Accessible from three sides
- Small footprint of tower
- Flush deck
- Skidding of all intervention equipment
- Single lift installation



## WELL INTERVENTION

### RISER BASED SYSTEM

Huisman's 800mt Multi Purpose Tower is perfectly suited for riser based well intervention. The unique passive heave compensated hoist system of the MPT provides safe and redundant means to supply top tension to the riser. The rails on the MPT are extended into the moonpool allowing the guide trolley to travel with the load during the deployment. For ultra-deepwater operations or operations in harsh environments the passive heave system of the MPT can be upgraded to double capacity. With this upgrade the maximum heave stroke of the system is doubled.

Instead of the passive heave compensation upgrade Huisman also provides riser tensioner systems that can be added to further extend the system capability. The riser tensioner system will allow a broader range of operations and allows

handling of heavier riser and extended water depth capability. To improve logistics and equipment handling on deck Huisman also supplies pipe handling equipment and deck skid systems. The modular nature of these systems combined with the small footprint and excellent accessibility of the MPT allow for an almost infinite number of system variations and deck layouts. With these tools Huisman can provide efficient and safe solutions for both monohulls and semi-submersibles.

Typical applications for the riser based system include:

- Wire line and slick line services
- Coiled tubing services
- Coiled tubing drilling
- Through tubing rotary drilling

### FEATURES RISER BASED SYSTEM

- Multi Purpose Tower – SWL 800mt
- Active and passive heave compensation
- Splittable blocks
- Accessible from three sides
- Hoistable drill floor
- Flush with main deck
- Offline storage for riser tensioning ring
- Deck skid system
- No unguided lifts during riser installation



## MODULAR RIGS

The oil and gas exploration and production industry is currently facing the challenge to commercially exploit unconventional resources, requiring large amounts of wells to be drilled in areas that have traditionally not always been exploited. As a result, drilling will need to be executed under stricter safety, transportation, and environmental regulations. Furthermore, the well cost will need to be lower for the resources to be exploitable.

Huisman's first land drilling rig, the LOC250 was firstly introduced in 2005, was designed to take advantage of Emerging Casing While Drilling technology in order to reduce the cost as well as the environmental impact of drilling a well. After a few years the demand for deeper / horizontal wells triggered the development of the LOC250's successor: the

LOC400 with a higher hook load capacity and the ability to drill deeper wells. To meet today's demand for faster, more flexible operations in unconventional plays, Huisman has taken the lessons learned from their previous modular rigs and redesigned them into a new serie of modular rigs.

### REDUCTION OF FLAT TIME

Huisman's drilling rigs are designed to reduce flat time on any well. Reduction of flat time includes extremely quick rig moves, offline testing of BOPs, incorporation of all sensors in rig design to reduce third party equipment, casing running equipment included with rig package, efficient autodriller with very accurate weight on bit and one size fits all pipe handling. This results in rigs that reduce unseen downtime, as less time is spent waiting and paying for third party equipment.

### AUTOMATION

The rigs are designed to move people out of harms way. The high degree of automation, including automated connections and automated tripping, substantially removes people from the drill floor during most operations and minimises human involvement during other operations. Due to the high grade of automation, a limited crew is needed. It is no longer necessary to have a crew on the drill floor during the process. The driller oversees the operation from the cabin and can intervene at any time when necessary. During autotripping, tripping in and out of the hole can be done with low physical interference of the driller. The autotrip function continues its cycle while guarding certain parameters such as hook load and safety interlocks.

### FEATURES MODULAR RIGS

- High automated tripping speeds
- Auto driller
- Fast rig moves
- Multi pad drilling
- Double drum drawworks
- Splittable blocks
- Rig walking system
- Independent backyard
- Craneless rig up
- Integrated Huisman mpd (option)



## ONSHORE DRILLING

### LOC400

Two of the most important features of the LOC are its compact size and the possibility to break down the entire rig into 19 modules with the dimensions of standard ISO containers.

Since the standard ISO containers can be transported quickly and economically by any container ship, train, or truck, the LOC can be used to drill wells anywhere in the world. Transportation cost between worldwide locations are no longer an issue. The craneless rig up procedure and standard road transportable modules further reduce human exposure during the activities with the most risk and lower the time required for mobilisation. The LOC is a highly automated rig built for quick rig moves and high performance drilling through high automation.

### INNORIG SERIES & HM150 RIGS

The Huisman modular rigs are designed to better fit the needs of a drilling rig in modern land and offshore applications. The

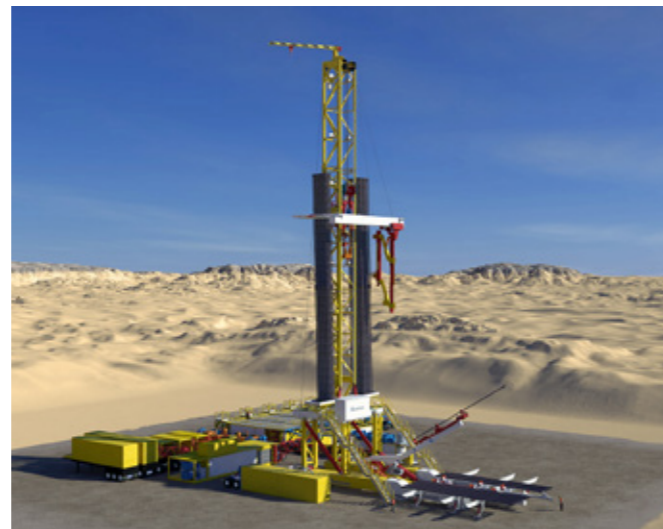
rigs can easily be built up and moved quickly between wells, either between single locations, or multiwell pads. The HM150 rig is fully trailerised and can be moved within a few hours. The modular InnoRig 250 is made for fast rig moves and easy rig up. The InnoRig XL is designed for maximum efficient operations, characterised by high automated trip speeds of > 4,000ft / hr, fast connections, large setback capacities and integrated casing running.

The rigs can be delivered with a walking system to enable pad drilling. Due to the open substructure, wells can be easily approached. For land applications, the craneless rig up procedure and easy transportable modules further reduce human exposure during the activities with the most risk and lower the time required for mobilisation. Offshore, the rig can be installed in a few loads, minimising installation time. The modular rigs are specifically designed for the development of today's and tomorrow's unconventional resources.



#### FEATURES LOC400

- Small footprint
- Auto drilling and tripping
- Very quick rig moves
- Splittable blocks

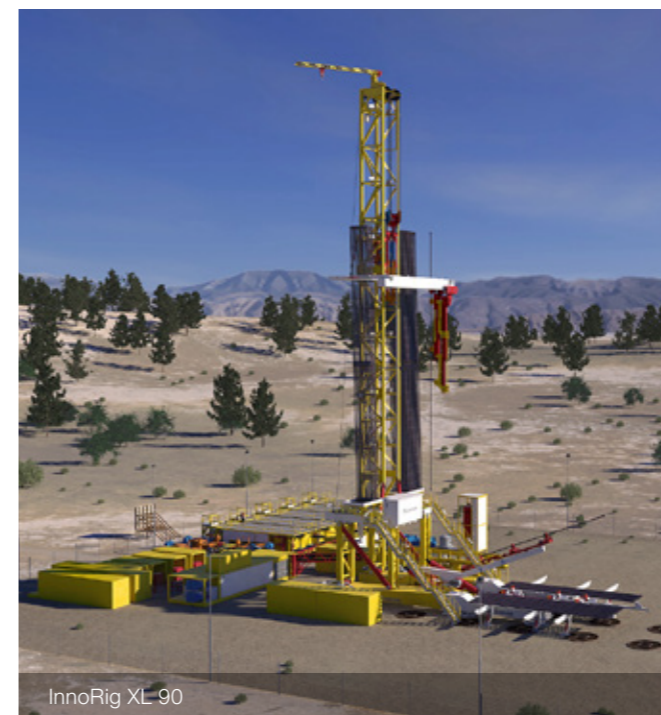


#### FEATURES INNORIG

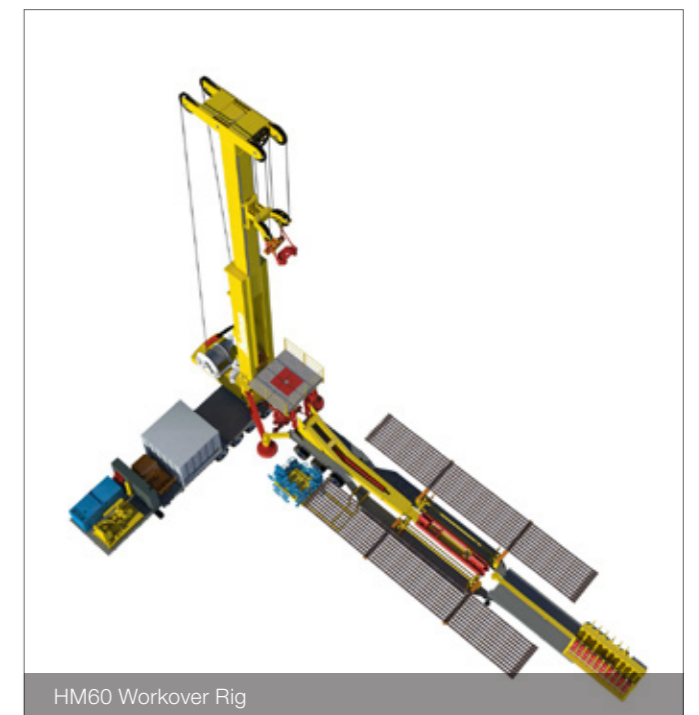
- Auto drilling and tripping
- Small modules
- Multi pad drilling
- Double drum drawworks
- Splittable blocks
- Rig walking system
- Independent backyard



HM60, HM150, InnoRig C400, InnoRig L60, InnoRig XL90/120



InnoRig XL 90



HM60 Workover Rig



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