DRILLING
HUISMAN PRODUCT BROCHURE
Huisman is a worldwide operating company with extensive experience in the design and manufacturing of heavy construction equipment for world’s leading on- and offshore companies. Founded in 1929 and originally a steel construction company - Huisman joined forces with engineering company ITREC in 1987 to develop products entirely under own management, from concept to installation. Our product range can be divided into six main categories: Cranes, Pipelay Equipment, Drilling Equipment, Winches, Vessel Designs and Specials ranging from stand-alone components to highly engineered integrated systems.

Our production is divided between our production facilities in The Netherlands, China and the Czech Republic. The construction of our new production facility in Santa Catarina, Brazil, has started early 2012 and will be operational in 2015.

SAFETY, HEALTH AND ENVIRONMENT
We have high values on being a responsible company and therefore the safety, environmental and health impact of our operations is a priority within all stages of the project.

QUALITY
The equipment delivered by Huisman is often the critical main equipment onboard and its reliability is of utmost importance to our clients. Delivering high quality products has therefore been a key company value since its establishment. As a result, our equipment is internationally known for its high quality and reliability during operations. It meets the most stringent performance criteria and is certified by recognised authorities such as ABS, DNV, API, TÜV, Lloyd’s etc.

SERVICE
A dedicated worldwide operating service team of skilled professionals is on stand-by to provide advice, training and service support before, during and after installation and delivery. Our service network is managed from Huisman in The Netherlands and our local service offices in Rio de Janeiro (Brazil), Houston (USA), Perth (Australia) and Singapore are on stand-by to provide service support, on location, as well as by remote access.

TRAINING
Huisman founded the Huisman Academy in 2011. This Schiedam-based training facility is used to support Huisman clients in operating and maintaining the equipment in the most effective and safe way. The Huisman Academy can offer simulator training on how to operate the Huisman equipment.

RELIABLE PARTNER
Due to our strong belief in long lasting partnerships with our clients, our commitment to finding new technical solutions and our dedication to delivering them as turnkey projects, we are internationally valued as a solid, reliable partner. Our extensive track record and the large number of long-lasting client relationships prove that we deliver state-of-the-art equipment, fully tested, within schedule and ready for commercial operation.

TURNKEY DELIVERY
Our in-house design and engineering expertise, in combination with our production, testing, commissioning and installation facilities, enable us to deliver custom-designed equipment on a turnkey basis.

INNOVATIVE SOLUTIONS
We are constantly working on new solutions and systems which, we believe add value to the market’s existing technologies. These innovations have been implemented into many of our products. As we have extensive operational experience with a wide variety of heavy construction equipment, we are able to use the best solutions for new products and projects. Our internal disciplines include Mechanical, Structural, Naval, Hydraulic, Electrical and Software Engineering.

GLOBAL OPERATIONS
A global market requires global and local solutions. Therefore, Huisman has expanded its engineering and production capacity from Schiedam, The Netherlands, to Sviadnov, Czech Republic, in 1997 and in 2007 to Fujian, China. Generating over 100,000m² of total production surface. All facilities play an important role in the Huisman production force. The construction of our new production facility in Santa Catarina, Brazil, has started early 2012 and will be operational in 2015.

For additional local sales and engineering support, Huisman holds offices in Rio de Janeiro (Brazil), Houston (USA), Bergen (Norway), Perth (Australia) and Singapore.
For local sales, commissioning, service and after sales support, Huisman has offices in Schiedam (The Netherlands), Rio de Janeiro (Brazil), Fujian (China), Rosenberg (USA), Bergen (Norway), Perth (Australia) and Singapore.
For more information about our locations, please visit our website huismanequipment.com.

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Huisman has been designing and building equipment for the offshore drilling market for over 15 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 improve 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 II (2013). After delivery of these vessels, Huisman further developed the design, resulting in the HuisDrill 12000. This design exceeds many of the capabilities of competing drillship designs.

In 2005 Huisman introduced its first land drilling rig to the market: the LOC 250. This was a fully containerised drilling rig for use on land. The introduction was soon followed by the LOC 400 of which several units are operational in the US and more are under construction. Currently a new land rig, the InnoRig, is under development that will be able to efficiently drill multiple wells on one drill site.

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 two well intervention systems, one for open water and one for riser based well intervention. Another three are under construction.

Huisman is continuously exploring and realizing new solutions to improve drilling operations. Huisman is looking for ways to safely and efficiently take offshore drilling to the arctic regions, where many believe large undiscovered oil reserves lie hidden. Another focus point is to further improve efficiency and reduce HSE risks by fully automating the drilling system. The land rigs are already able to trip in and out of the hole fully automatically, without the need of any people on the drill floor.
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 on the well intervention vessel Q4000 operated by Helix in 2001.

Over the years the MPT has evolved through several stages into the 2400 Kips Dual Multi Purpose Tower (DMPT) that is now featured on the UOW drilling vessels Noble Globetrotter I and II operated by Noble Drilling. In new designs the capacity can be increased to 3000 Kips.

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 the 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 centre the DMPT is equipped with a pipe racker system consisting of twelve (12) manipulators. On each corner of the DMPT three (3) manipulators are mounted between well center and the setback drum. The manipulators shall be utilized to transport pipes vertically from the setback drum to well center (and back). It moves up and down by rack and pinion and can rotate and extend to well center or setback drum.

Equipment is located inside the MPT offering good protection from the harsh marine environment. It also provides a safe environment when doing 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 20 to 16, 12, 8 or 4 falls in just minutes. Splitting the blocks from 20 to 4 falls reduces the hoist capacity, but increases the hoist speed with 500%.
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 pressurized 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 switchboard, 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.
**MULTI PURPOSE TOWER**

**Name of units:** Noble Globetrotter I & II  
**Owner:** Noble Drilling  
**Delivery:** 2011, 2013

- 2 x 1,090mt, 16 falls, splittable blocks  
- 4 x pipe racker  
- 2 x setback drum  
- Topdrive storage  
- Hoistable construction floor

**MULTI PURPOSE TOWER**

**Name of units:** Noble Bully I & II  
**Owner:** Noble Drilling/Shell  
**Delivery:** 2009, 2010

- 1,090mt, 16 falls, splittable blocks  
- 545mt, 8 falls, fixed blocks  
- 4 x pipe racker  
- 2 x setback drum

**MULTI PURPOSE TOWER**

**Name of units:** Well Enhancer  
**Owner:** Helix  
**Delivery:** 2009

- 150mt, single fall, 3,000m  
- Subsea installation & open water intervention

**MULTI PURPOSE TOWER**

**Name of units:** Q4000  
**Owner:** Helix  
**Delivery:** 2001

- 800mt, 12 falls, splittable blocks  
- Drilling & riser based intervention
FEATURES TEST MPT
- 3.0 min lbs (1,360mt) rated load (internal)
- 600mt rated load (external)
- Dual draw works/splittable blocks
- Active/passive heave compensation systems
- Up to 180ft stands
- Full scale setback drum
- Up to 4 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" up to 50m
  - Ø 20" up to 400m
Winner of the Shell ‘Global Floater Rig of the Year’ award.
Bully I (GoM): Rig of the year 2013, Bully II (Brazil): Rig of the year 2014.

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-oriented 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.

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 optimization 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. The first drillships based on the Huisman’s drillship design are already operational.
In the first half of 2007 Huisman was awarded a contract for the design and manufacture of the drilling tower and related pipe, riser and BOP handling equipment for the Noble Bully I. The order for outfitting 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 the 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.

The drilling unit is optimized as a whole. The design of the drilling package, the functionality thereof and the material flows on board is the top priority. The design of the vessel is made to optimally accommodate the drilling process.

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

ORION
The innovative Orion class is a design for a harsh environment semi-submersible drilling unit suitable for various water depths. The unit’s main task is exploration and development drilling, but it is also suitable for various other tasks. A key feature of this unit is the flush drill floor with the flat main deck; this is possible by integrating the DMPT with the movable construction floor in the design. Because the DMPT has an unobstructed path to the drill 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 centre of gravity and increases the stability of the unit resulting in a high payload/displacement ratio.

Depending on the requirements the unit can be designed to work in mid water to ultra-deepwater with small adjustments. The unit can be equipped with thrusters to have DP3 capability for station keeping. Mid water models can be outfitted with an anchoring system or thruster assisted mooring.

FEATURES ORION
- Flexible design
- Flush main deck
- Dual Multi Purpose Tower
- Movable floor
- Automated pipe handling
- Riser tensioner system
- High payload/displacement ratio
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 customized for setting the unit on the sea bed in shallow water.

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 costs. Therefore reducing these costs 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 costs 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 centres, which allows for new improved handling procedures that increase efficiency and safety. The superior accessibility to the well centre and small footprint of the MPT are ideally suited for well intervention and subsea installation services. Subsea equipment can be skidded into the well centre 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 (4x4)
- Flush deck
- Skidding of all intervention equipment
- Single lift installation
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

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 a 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-deep water operations or operations in harsh environment 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 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

- Wire line and slick line services
- Coiled tubing services
- Coiled tubing drilling
- Through tubing rotary drilling
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 costs will need to be lower for the resources to be exploitable. Huisman’s first land drilling rig, the LOC 250 first introduced in 2005, was designed to take advantage of emerging Casing While Drilling technology in order to reduce the costs 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 LOC 250’s successor: the LOC 400 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 to form the new InnoRig drilling unit.

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 BOP’s, 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, one size fits all pipe handling. The result is rigs that reduce unseen downtime, as less time is spent waiting and paying for third party equipment.

Automation
The rigs are designed to remove people out of harms’ way. The high degree of automation, including automated connections and automated tripping, removes people from the drill floor during most operations and minimize human involvement during other operations. Due to the high grade of automation, a limited crew is needed. It is no longer necessary to have personnel on the drill floor during the process. The driller oversees the operation from the cabin and can intervene at any time when necessary. During auto-tripping, tripping in and out of the hole can be done without physical interference of the driller. The auto-trip function continues its cycle while guarding certain parameters such as hook load and safety interlocks.
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 costs between worldwide locations are no longer an issue.

The crane-less 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.

The InnoRig is designed to better fit the needs of a drilling rig in modern land and offshore applications. The InnoRig can easily be built up and move quickly between wells, either between single locations, or multwell pads. The rig can be delivered with a walking system to enable walking between wells. Due to the open substructure, wells can be approached from any angle. The rig package and backyard is designed in container size modules.

For land applications, the crane-less rig up procedure and road legal 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, minimizing installation time. The InnoRig is specifically designed for the development of todays and tomorrows unconventional resources.

**LOC**
- Small footprint
- Completely built up from ISO containers
- Auto drilling and tripping
- Very quick rig moves
- Splitable blocks

**Innorig**
- Auto drilling and tripping
- Small modules
- Multi-pad drilling
- Double drum drawworks
- Splitable blocks
- Rig walking system
- Independent backyard
Huisman Academy

The Huisman Academy, located just outside the Huisman Schiedam premises, was established in 2011 to facilitate Huisman clients with the training of knowledge and skills to safely and efficiently use their Huisman equipment. In addition, the Huisman Academy supports the internal Huisman organization by organizing and facilitating non-technical trainings, educational programs, presentations and workshops.

Simulators

To accommodate different trainings, two drilling simulators are available: one mobile LOC 400 simulator with flat screens and one HuisDrl simulator with a cylindrical screen. These simulators make use of exactly the same operating system software as the actual Huisman equipment. The Huisman simulators are 3D virtual simulators mimicking the innovative LOC 400 modular land rig and DMPT.

It is for drilling contractors and oil companies who wish to:
- Train personnel
- Optimize their operations
- Study new handling sequences

Training Procedure

It is possible to simulate the following procedures on the simulators:
- BOP and riser handling
- BOP landing and hanging off the riser string
- Stand building with drill pipe/casing
- Drilling
- Tripping in/out the hole
- Various well kick procedures

Operating Modes

There are two operating modes on the simulator, namely:

- Training mode
- Presentation mode

In training mode the operators can get acquainted with the operating philosophy of the Huisman LOC 400 and DMPT drilling units.

In presentation mode it is possible to do predefined flyovers around the rig with the possibility to select operation and camera switching. Various weather conditions can be selected with sound.