

Lightweight Fibre Cable

Stiffer, Stronger and Longer

As today's offshore industry is rapidly exploring the possibilities of deep sea drilling and production operations, the need for alternative materials increases. At increased water depths, the conventional steel wire or braided rope mooring systems show a number of disadvantages. Not only are synthetic cables lighter, they will also generate less downward pull on platforms, which results in more payload on these platforms. Cables produced by FibreMax are available in any break load and length. The significant reduction in size, stretch and weight

over traditional materials as steel wire or braided ropes offer many advantages in easier handling, easier transport, safer and faster operations and downsizing of constructions.

Examples for typical offshore applications are:

- Deep sea mooring.
- Tension leg platforms.
- Spar platforms.
- Semi-submersible units.
- FPSOs.
- Anchoring of buoys.



The move of the oil industry towards greater depths calls for innovative solutions. The conventional steel wire or braided rope systems show a number of disadvantages that can be eliminated by the use of fibre cables. Offshore Industry visited FibreMax – an innovative producer of revolutionary lightweight precision cables.

- Heavy lifting.
- Salvage/rescue equipment.
- Offshore wind turbine mooring.

Endless Winding

The lightweight precision cables are produced by means of a unique production process. All cables are produced with endless winding technology which is a totally automated process of continuous winding of parallel strands of fibres around two end fittings until the right cable strength or required cable stretch has been reached. After the required length has been programmed, the Endless Winding Robot (EWR) computer calculates the amount of fibres and the amount of loops required for the specified cable. During the winding process, the EWR maintains an equal tension in all fibres with an accuracy of 0,1%. This results in the highest break load, lowest stretch and lowest possible diameter. It also ensures that cables are produced with high repeatability; when producing multiple cables FibreMax guarantees that all cables will have exactly the same specifications. When the desired amount of loops has been reached, the cable is compressed by a strong and lightweight 'wrap-around' tape



Sales Engineer Wilco van Zonneveld (left) & President Rinze v/d Schuit

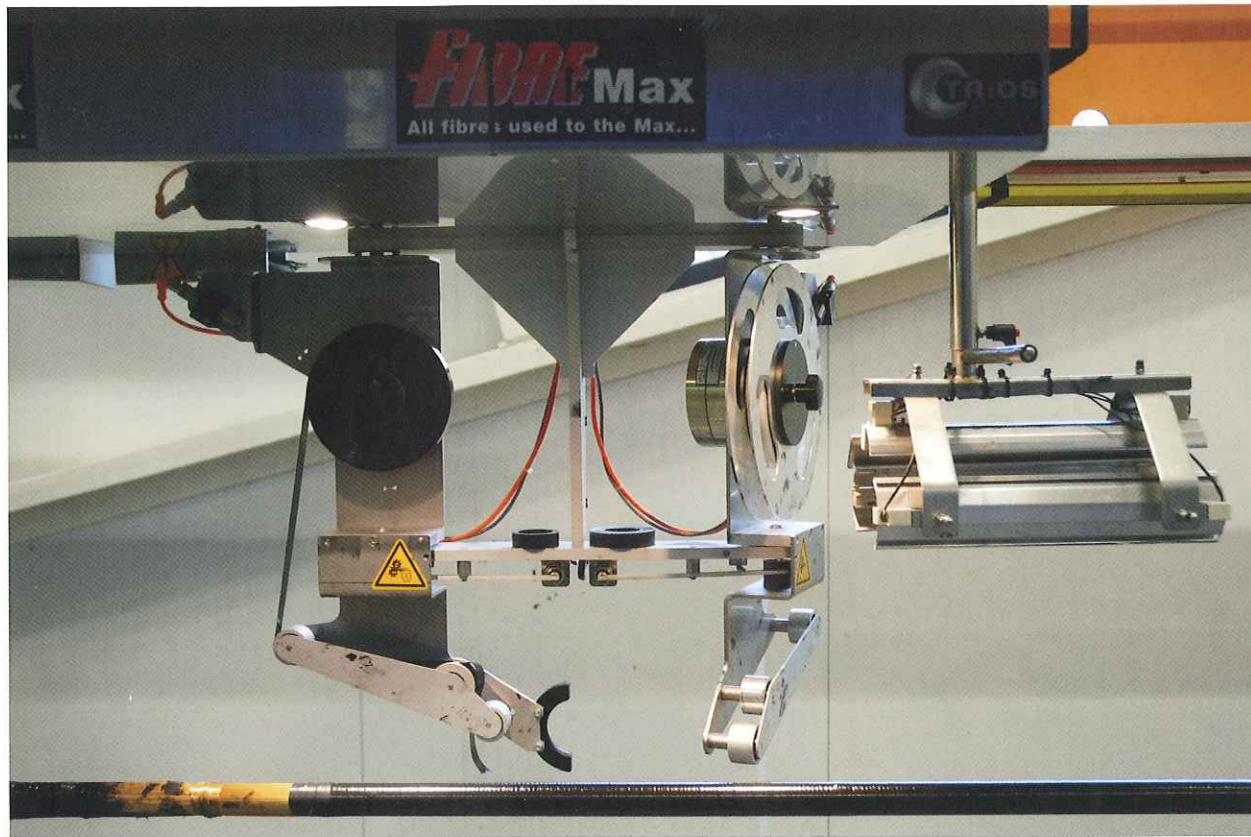
Pioneering Technology

Since the late 1990s, the use of polyester mooring systems was pioneered by Petrobras and has since become more and more accepted by the offshore industry. Recent studies show that with increasing depths the need for stiffer and stronger mooring lines is preferred to achieve desirable mooring systems characteristics. There is an ongoing interest from the offshore industry to improve mooring line performance and reduce the line weight by using different fibre materials. Not only will stiffer and stronger lines give access to the exploration of larger depths, they will also reduce the required lifting equipment and storage facilities.

FibreMax provides the offshore industry with cables that can meet the requirements for stiffer, stronger and longer mooring line applications. The main benefits are:

- 80 to 90% lower weight than steel wire *).
- 10% lower diameters than steel wire *).
- 30% lower weight than braided ropes *).
- 30% lower diameters than braided ropes *).
- No construction stretch.
- No 'bedding in' necessary.
- Constant stiffness
- Maximum EA at 5% of MBL.
- Can be used until 90% of MBL.
- No spliced terminations
- No yarn-to-yarn abrasion.
- Less installation costs.
- Lifespan up to forty years (depending on usage).
- Continuous length up to 5,000 m.
- Maintenance free.

* When compared at the same break load.



to ensure minimal diameter and protection of the fibres. After this tape has been wrapped around the cable, another light but strong heat-shrink tape is automatically wrapped around the cable. These two layers of tape act as a particle filter layer to limit the amount of particles from protruding and destroying the fibres.

Bullet-Proof

After the cable has been sealed, a 'bullet-proof' braid of Dyneema, aramid or polyester is applied to ensure protection against wear and abrasion. When needed, the cable can be provided with a special low drag surface to reduce vortex-induced vibration (VIV). Because of their very light weight, the cables already have a higher natural frequency than steel wire ropes.

A special coating can be applied to improve the properties of the protective braids. The colour of this coating can be adapted to the customer's request. Other protection methods are available upon request. All cables are equipped with a radio frequency identification (RFID) track-and-trace system which gives information on all production data of the cable. This will allow the service department to identify any cable in the event of a return for service or testing.

Watertight Termination

The endless winding production process has the additional benefit that the terminations (or end fittings) of the cable are directly incorporated. These terminations are specially designed to match the desired cable properties and to support the amount of fibres. The cables can be supplied with different types of end fittings in order to meet the customer's requirements. They are supplied in different sizes assuring the smallest possible dimensions and weight.

Types of end fittings that can be supplied are:

- Pin fittings: size of pin diameter can be engineered to customer specifications.
- Thimbles: different types can be supplied according to industry/offshore standards.
- Forked fittings; to reduce weight instead of having a heavy socket.
- Soft-loop; the cable has no end fittings and can be used as a sling.

The dimensions of the terminations are almost twice as small as can be accomplished by standard wire/rope manufacturers. The terminations are designed to support





full 100% minimum break load (MBL). The terminations are vacuum sealed with polyurethane (PU) to ensure perfect water tightness. Depending on the application, end fittings can be supplied in different materials such as stainless, galvanized or coated steel.

Overwhelming Interest

FibreMax cables are a very promising alternative for the traditional steel wire or braided rope cables. Although the same technique already finds successful application in the yachting industry, the offshore industry is a new exciting area of application. FibreMax is active in the offshore market since September last year and the initial interest from the market is overwhelming. The company also receives very positive feedback from other industries such as heavy lift companies and crane manufacturers. The areas of application are unprecedented: engineering companies have approached FibreMax for application in observation wheels such as the Singapore Flyer and the London Eye, where the fibre cables could replace the traditional steel wires.

i. www.fibremax.nl

From Yachts to Offshore

FibreMax is an initiative of SmartRigging which was founded in 2004. Over EUR 4 million was invested in research and development of a unique and state-of-the-art Endless Winding Robot and a purpose-built factory. SmartRigging succeeded in adapting endless winding technology for big fibre cables or linear tension members. The first application for these high performance cables was found in the sailing industry. On a sailboat, the cables are used as rigging (stays) to support the mast. The lightest and strongest possible polyphenylene benzobisoxazole (PBO) cables were supplied for leading teams in the America's Cup – with the brand name SmartRigging. Yacht rigging has to survive the toughest condition in the sailing world; high dynamic loads, winds of sixty knots and waves of fifteen meters. Over the years it has been proven that the endless wound SmartRigging cables can survive the toughest conditions on earth. SmartRigging has proven itself as a reliable and experienced partner in the yachting industry. The experience gained within the yacht industry is used for the production of FibreMax lightweight precision cables for industrial applications. The production facility in Joure, the Netherlands, is purpose-built to the company's requirements. It houses offices, an R&D department, test facilities, storage rooms, workshops and the Endless Winding Robot. In the production facility cables can be produced from 3 up to 140 m. In the new factory, which is expected to be completed in 2011, cables with a continuous length up to 5,000 m and with a minimum break load (MBL) of 10,000 t can be handled and produced.

