

MOORNEWS

INFORMATION FROM AND ABOUT MOORLINK

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MoorLink launches a more compact wire rope clamp - the MK6

The newly developed version of the MoorLink wire rope clamp -MK6- is launched with already more than 50 units delivered.

The MK6 is a more compact wire rope clamp compared to the MK5 and MK4. We still use the superior grip technology to avoid the clamp to slide on the wire rope, however it has made the handling more convenient by less weight and simplified assembly. This combined with an also improved swiveling function makes the MoorLink WRC MK6 an excellent tool for subsea uplift or updraft operation. If requested the MK6 can be altered to enable pre-assembly on the wire rope and spooled on a large AHV wire drum.

The WRC MK6 is available for wire rope diameters 38-96 mm or inches 1.5"-3.78" as standard range. Other diameters can be manufactured upon request. ■



MoorLink's CEO looks back and forward



CEO Björn Palmquist

MoorLink has just finished its fiscal year end of April and can look back at its most successful year. Now we are preparing for the future

MoorLink supplied a record number of swivels the majority able to meet the requirement to be used in R5 chain systems, wire rope clamps and we also participated in a couple of large projects for Long Term Mooring solutions.

In addition we started our Arctic studies. In order to meet the upcoming requirement for equipment in cold area conditions a lot of parameters are to be investigated. We work closely with world class steel suppliers giving us the best chemical compositions which are then heat treated to reach best condition. Strength and toughness are the most important parameters to meet. MoorLink also performed a full-scale MBL test of a deep-frozen swivel (-40 degrees C). See separate article below.

We also welcome Rebecca Jones as project controller and Nicolas Berner Wolf, a technical physics as R&D engineer onboard the MoorLink team.

MoorLink always strives to be the world leading mooring component supplier and we hope to serve the market with quality products for many more years. This might include broader engagements with other front leading companies. ■

MoorLink goes Portuguese!

With Portuguese speaking markets flourishing MoorLink has the intention to improve its reach and has launched its webpage in Portuguese.

This strategy conveys a powerful dynamic signal internationally that MoorLink is devoted to obtaining and keeping a local presence close to the end user.

We see a growing demand and increased potential for MoorLink's products in the region. "With the Brazilian

production expected to increase significantly over the coming years and with much of the oil found at large depth, the demand for reliable and proved components can be expected to increase." In its 2013 World Energy Outlook, the International Energy Agency (IEA) stated that "Brazil plays a central role in meeting the world's oil needs through to 2035, accounting for one-third of the net growth in global supply. (...) Such an increase in supply is heavily dependent

on highly complex and capital-intensive deepwater developments, where Brazil is set to consolidate its position as the global leader."

"As MoorLink's products are made from top quality steel and we have, for example



already delivered swivels that can operate down at 3000 m depth and has a minimum break load of 27 000 kN. There will be many situations where MoorLink's innovative swivels and connectors can contribute decisively to project success." MoorLink responds regularly to requests for customized mooring solutions. ■

ARCTIC RESEARCH

MoorLink's research engineers has developed a new design for a swivel suited for the harsh arctic market. New material specification and extensive testing shows that the specific new swivel type 177-M5-A endures even the most extreme conditions, minus 40 C (-40 F) being subjected to a Minimum Break Load (MBL) test.

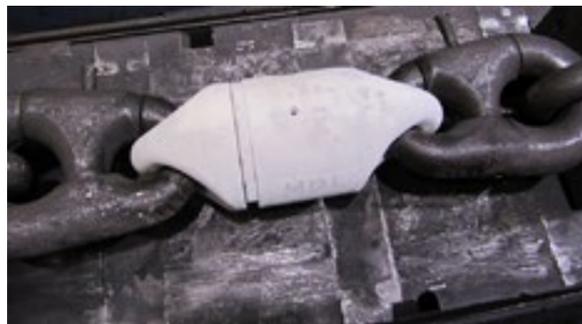
Material expert Hans Aronsson states: "It is quintessential for the quality of the steel to get the entire manufacturing process meticulously precise. We now take things one step further with an improved material specification of quenched and tempered low alloy engineering steel. This will reassure MoorLink's position as a top quality brand world-wide"

MoorLink shall also collaborate in a Joint Industr Project (JIP) on the subject of mooring equipment for an arctic environment. In this venture MoorLink shall be working together with some of the industries forerunners in developing safe and reliable equipment for the harsh arctic weather conditions, whereas the environmental concern is a top priority.

MoorLink's arctic research program studies the mechanical properties of the material at subzero temperatures. The steel

is continuously evaluated aiming to improve and establish added stability and adjust the chemical analysis to meet the high demand. This will further optimize the performance and durability of all of MoorLink's products ■

Facts:
New material specification and extensive testing shows that the new swivel type 177-M5-A endures even the most extreme conditions.
The 177-M5-A can be used with 3" R5 or R4 chains



MBL test at -40 ° Celcius, 735 MT

NEW CHALLENGES AHEAD FOR CHAIN LOCKER CLOSURE DEVICES

In 2001, Morten Marine Design AB delivered the first units of closure devices to BP's Thunder Horse. Today, almost 15 years later, we have delivered a number of rig sets for studless and studded chain and on for each delivery process we have gained valuable experience, which our design engineers have utilized to improve and re-develop the products. At this stage we are especially proud to proclaim "we are the best" in this narrow product niche.

Total involment

The inventor, Morten Gundersen is still very much involved in the total process, all the way from pre PO arrangement development together with the client all the way to the installation and testing onboard. This personal involvement and hands-on work in all stages of the projects really makes Morten an "expert" in this field and all the valuable experiences he gains can be carried forward to be used as improvements for future design.



Morten Gundersen

The challenge

Naval architects around the world are asking for class approved WATERTIGHT closure devices. This large challenge has been taken up by Morten and his team who are progressing. Based on preliminary prototype testing and ongoing dialogues with the classification society's stability experts, a design is being completed and a project plan exists for type approval testing late this summer (Sept – Oct 2014). The first units will be installed on a drilling vessel at the end of 2014.

Once the first rig set has been successfully installed and approved it will open great opportunities for naval architects and operators to enable large gains in deck load capacity and/or free attractive "real estate" on main deck by moving the chain locker down flooding points to lower elevations ■



LLOG's Delta House under construction at HHI



MoorLink AB teams up with Balmoral Offshore

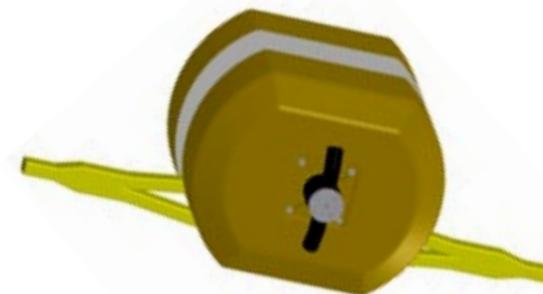
MoorLink AB teams up with Balmoral Offshore Engineering to deliver integrated mooring line buoyancy and connecting elements.

MoorLink patented M-links was further jointly developed by integrating Balmoral mooring line buoyancy. MoorLink was selected as subcontractor for this important component based on MoorLink's reputation as manufacturer of high-quality mooring components. Being an approved mooring manufacturer to DNVGL standards has also played a decisive roll.

Using integrated Balmoral buoyancy elements in the M-links the mooring line connector is compact, safe, easily connected and deployed over the stern of the anchor handling vessel. Installation procedures were given special attention during the development phase, ensuring that the addition of buoyancy in the connector does not result in undesirable effects on the mooring ropes. Potential fatigue issues with the commonly used chain tether are effectively eliminated by removing the tether altogether.

Manufacturing of structural steel components connecting the 250 mm diameter polyester rope will be managed solely by MoorLink. Balmoral supplies the buoyancy components. The assembled, approved and tested link structure will be shipped to Aberdeen for interfacing with the buoyancy elements produced in Scotland. The project is on schedule to be delivered on time.

MoorLink sees the collaboration as a starting point for a new era in the rope connector segment, where more features and technology is combined in each mooring component. The payback is more compact devices, allowing for use of more efficient on-deck handling and deployment, saving valuable installation time for the end-client ■



MoorLink
M-Link with
integrated
Balmoral mooring
line buoyancy

MoorLink sponsors high-tech sailing

Moorlink entered a sponsor agreement with a high-tech sailing catamaran team. The team named WAR team is helmed by the silver Olympic medalist Hans Wallén and they started the season in a perfect mode winning the M32" Gold Cup in Miami

The M32 catamaran is an all carbon fibre epoxy moulded ultra light 32 foot long boat. In good conditions they easily make more than 15 knots of speed upwind and up to 35-40 knots speed when reaching. The completion is extreme hard with Olympic gold medalists attending and all boats have first class crews. The events have now moved from USA and regattas are planned in Gothenburg in May, Oslo in June followed by Malmoe and Copenhagen in August and the last event is in Stockholm in September. All racing will be city racing giving the spectators a close feeling of the speed of these "monster boats" ■



You can follow the detailed program under www.32cup.com

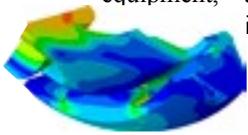


M32 Cup event calender

Finite Element Calculations for Mooring Equipment

MoorLink AB has already since its start employed finite element calculations to assess the structural characteristics of its equipment design. Today, the use of finite element calculations both during initial and at later design stages for verification purposes is commonplace, and is considered a pre-requisite for efficient product development. There are, however, significant differences and challenges when using FEM for mooring equipment, which are highlighted in this article.

Mooring equipment is safety critical equipment, and as such the industry standard approach would be to use rather large "knockdown" factors on material properties, as well as employing large amplification factors on the expected loads. This would result in relatively light-stressed designs, inherently safe by their large margin to failure. "Knock-down" factors related to material are often referring to the yield limit, limiting the designer to be a relatively large margin below yield stress

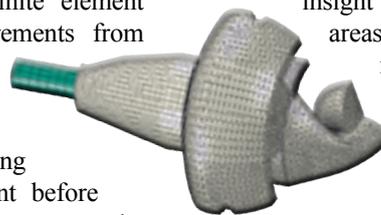


for typical industry designs. The latter method is not employed in the mooring industry. Instead, by numerical simulation or by employing special hardware such as hydraulic brakes, an expected maximum mooring line load is established with a relatively high accuracy. This load is then multiplied by a factor (>1) to establish the "Min Break Load" (MBL). At this load level no breakage should occur, as all class approved equipment is tested to this load. No material factors are used, implying that yield is allowed. Indeed, after an MBL-test typical chain links are elongated by several percent, indicating that the cross-sections are completely through-plasticized and approaching their plastic limit state.

This design philosophy is rather unique to the mooring industry, and poses great challenges for the finite element savvy engineer. As requirements from clients, class societies and legislators are constantly increasing on using finite elements as a verifying tool for mooring equipment before being manufactured and put to use, the

competence to evaluate and judge designs exhibiting fully plasticized behavior in the finite element calculations must increase. Also, the material models used in the FE-programs becomes of high importance, as well as reliability of material data used in the FE-calculations.

MoorLink offers expertise in the above mentioned engineering area, and is often used by other mooring equipment manufacturers to verify and evaluate mooring equipment designs. An ongoing effort to better understand the fully plastic behavior of mooring equipment is underway at MoorLink offices, where MoorLink is uniquely positioned as we specify materials, design, manufacture and test our own equipment in our everyday work. This gives MoorLink total insight in the strong and weak areas of FE-calculations for mooring equipment, insights that are shared with our clients for mutual benefit ■



> SHORT NEWS

Ongoing research and development projects

In order to assure the continued delivery of top quality and reliable products, we have intensified our research and development on new and existing mooring equipment. Working closely with the classification societies we make sure MoorLink products meet nothing but the highest standards.

We continue and extend our industry product M5 certification process – MoorLink products that can be used in R5 systems. Awaiting certification is a swivel that works with 92 mm R5 chain meeting a break load of over 1000 ton.

Arctic conditions is our arctic research project has designed a swivel that should soon be classified as a 92 mm R4 arctic class swivel with a break load of 8500 kN. We stand well prepared to meet the high demands of arctic mooring.

Moorlink has also put together a team of experienced engineers to intensify its research on its existing offshore disconnectable and reconnectable device ■

> EDITOR NOTES

As this May Moornews edition is set for printing we are in the midst of participating 2014 Offshore Technology Conference in Houston, Texas.

We are heading into a much welcomed summer and wish all our readers and customers a relaxing and sunny June, July and August!.



> CONTACT MOORLINK

Head office	Phone:	+46 (0)31 301 20 60
MoorLink AB	24 hours:	+46 (0)70 818 22 28
Bror Nilssons gata 5	Fax:	+46 (0)31 708 79 00
SE- 417 55 Gothenburg	E-mail:	info@moorlink.se
Sweden	Web:	www.moorlink.com

Agents worldwide
Kindly visit our website for contact details.

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