ENGINEERING TOMORROW

Customer Success Story:
Mooring tensioners using Vickers by Danfoss XL cylinders

When building bespoke mooring tensioners **ready for brutal conditions,** this customer **relied on Danfoss**

Location
West Africa

Segment
Offshore oil and gas

Challenge
Secure mooring for a floating liquefied natural gas vessel in brutal offshore conditions, which was essential to keep production on track

Solution
Close collaboration with the customer to design and manufacture bespoke XL cylinders with build-on high pressure accumulators (HPA) and Hydroclad laser cladding at Danfoss' Eindhoven facility in the Netherlands

Results
On-time delivery of 12 high-quality XL cylinders that enable top performance, extreme reliability, and major safety advantages

"Peace of mind was critical for our customer. Given our trusted relationship, they knew we could be relied upon to ensure success for them and their stakeholders."

Peter Claessens, Manager Customer Support and Supply Chain

VICKERS by Danfoss

Background

With a proven track record of performance and reliability, Vickers by Danfoss' XL cylinders are used in some of the world's toughest applications across demanding sectors like oil and gas, mining, hydropower, and more. When a customer working on part of a high-profile offshore venture in West Africa needed mooring tensioners for the project's floating liquefied natural gas (FLNG) compression and storage vessel, they relied on Danfoss.

Having already worked together for over two decades, the customer knew Danfoss would keep its promises. Additionally, a readiness to collaborate on customized designs, as well as manufacturing expertise, proprietary technologies, and high-quality solutions, all made Danfoss the customer's first choice. *"Peace of mind was critical for our customer,"* comments Peter Claessens, Manager Customer Support and Supply Chain. *"Given our trusted relationship, they knew we could be relied upon to ensure success for them and their stakeholders as one of the world's leading large cylinder manufacturers".*

Challenges

"The FLNG vessel plays a crucial role in the major offshore venture our customer was supporting," says Peter Claessens, Manager Customer Support and Supply Chain. *"Any issue with the ship's stability could disrupt the entire project—creating not only safety concerns, but also a considerable loss of time and money for all the stakeholders involved. It was up to us to make sure that did not happen".*

The stakes were high, but the customer's requirements also created some unique technical challenges. Danfoss needed to supply a bespoke solution for the unusual mooring system compensating for the motion of the waves, where the XL cylinders were in an atypical horizontal orientation.

Additionally, Danfoss' solution also needed to withstand brutal conditions. *"The challenge was not only continuous exposure to salt water and sea spray, but also to sand blowing over from the Sahara Desert in high winds,"* adds Peter Claessens, Manager Customer Support and Supply Chain. With project operations expected to run for up to three decades, Danfoss' solution needed to not only perform, but also be incredibly resilient at the same time.

Solution

To meet these challenges, Danfoss' decades-long application experience, manufacturing expertise, and commitment to the highest quality solutions were invaluable. *"We always aim to build long-term customer relationships,"* comments Kamil Kubica, XL cylinders Product Sales Manager. *"That is why we were ready to invest so much time, effort, and joint-thinking into this project".*

Design and manufacturing work took place at Danfoss' Eindhoven, Netherlands facility which boasts a team of dedicated project and application engineers, skilled assembly technicians and machining operators, as well as a state-of-the-art test facility. *"Our engineers collaborated closely with the customer for many weeks to develop a bespoke solution,"* says Peter Claessens, Manager Customer Support and Supply Chain, *"and as always we strived to make working together as quick and easy as possible".*

Once the best solution was agreed, working with Danfoss also brought major technical advantages. For instance, Hydroclad laser cladding—Danfoss' proprietary cylinder rod coating—offers superior corrosion resistance in salt water operations and has already been proven in the field for 10 years with no reported failures.

"Hydroclad is a very dense coating that allows no access to the base material, which is the usual cause of corrosion and coating failures," says Alpesh Shah, Global Product Manager – Cylinders. *"That is a critical issue to avoid, because corrosion does not just impair cylinder performance—hydraulic fluid can also leak into the sea creating environmental problems".*

To create the coating, a laser beam spot impinges the piston rod surface, producing a shallow molten pool. Hydroclad powder is then injected and, as the piston rod cools, the pool solidifies leaving cascading weld beads. The rod is then turned and polished to the final surface parameters.

Hydroclad is also fully field-repairable, which further reduces the cost of any necessary upkeep. *"Usually, cylinders would need to be dismantled and sent for recoating,"* Peter Claessens, Manager Customer Support and Supply Chain adds, *"but we can do repairs locally in application—minimizing both the cost and the time required".*

Danfoss also integrated a stroke measurement system to enhance the performance and safety factor of the customer's mooring tensioners. The system enables the customer to know the position of the piston in the cylinder and accumulator at any moment. This also allows leaks in the accumulator to be spotted early, so issues can be dealt with promptly. Without such a system, the first sign of a problem would be performance loss, or even sudden failure.

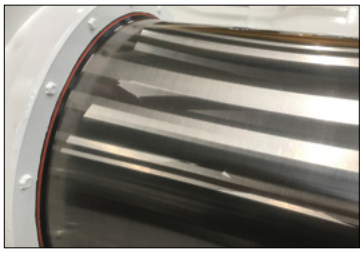
Results

With just a ten-month lead time, Danfoss' Eindhoven facility designed and delivered 12 mooring tensioner XL cylinders in carbon steel with build-on high pressure accumulators (HPA). With a 600 mm diameter and 4500 mm stroke length, these hefty cylinders have a design pressure of 230 bar (3335 psi). Each is equipped with high-grade stainless-steel piping and manifold blocks.

Throughout this multi-million-euro project, Danfoss' application and manufacturing experience were crucial to the customer—enabling a high-quality end product that combines performance, reliability, and safety advantages. The existing close relationship was invaluable, empowering Danfoss to understand the customer's needs in-depth and to collaborate effectively on the best solution.

By combining exceptional corrosion protection with an excellent sealing system, Danfoss' solution can withstand the application's tough environment, substantially extending the lifetime of the mooring tensioners and enhancing operational safety. At the same time, Danfoss' solution also lowers total cost of ownership by minimizing the risk of unplanned maintenance or equipment downtime.

"Our customer-focus was key to the success of this project, as was an expert manufacturing plant that always lives up to its promises and has a 100% on-time delivery track record," says Peter Claessens, Manager Customer Support and Supply Chain. Danfoss now stands ready to provide the customer with long-term support for repairs, spares, servicing, or upgrades as required in the future. *"We are always 'in it together' with our customers, working towards mutual success,"* Kamil Kubica, XL cylinders Product Sales Manager concludes. *"This project really brought that to life".*



Hydroclad laser cladding is Certified by DNV for use on Offshore Platforms

Suitable for offshore deep-water oil and gas exploration and production, marine, civil engineering, wave power and other heavy duty applications, Hydroclad anti-corrosion laser cladding can be applied to new cylinders or refurbished applications

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Danfoss Power Solutions, Nordborgvej 81, 6430 Nordborg, Denmark, Tel. +45 74 88 22 22, Fax +45 74 65 25 80
www.danfoss.com, E-mail: info@danfoss.com