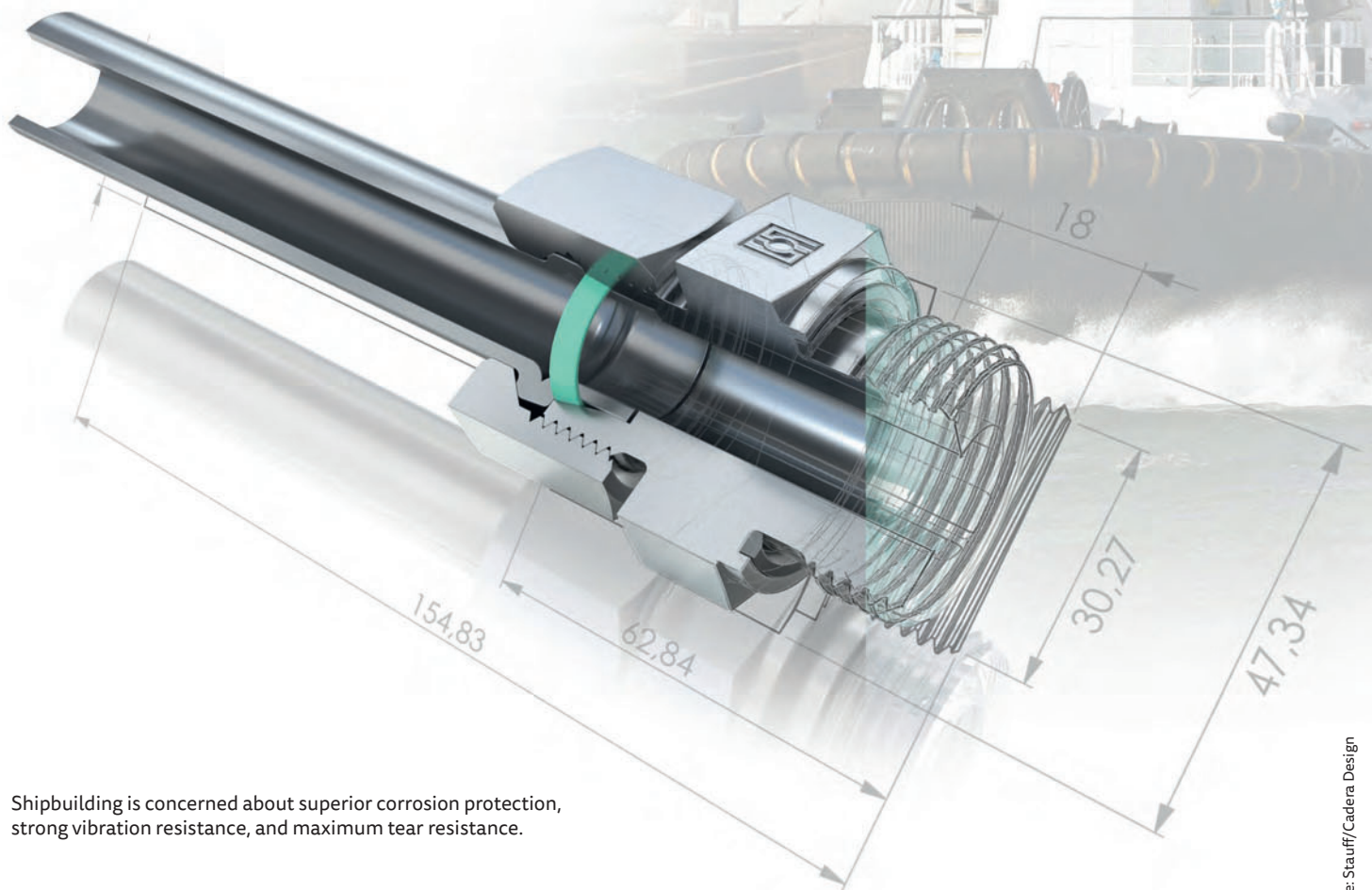




HYDRAULIC LINES

Leak-proof connections under adverse conditions

The Damen Shipyards Group's work boats are known throughout the world for their long service lives and high quality. This is also true for the design and installation of the complex hydraulic systems.



Shipbuilding is concerned about superior corrosion protection, strong vibration resistance, and maximum tear resistance.



Source: Damen

View into the shipyard: Damen ships are renowned throughout the world for their excellent durability and service life.

Six thousand ships have been built in just under a century – a workforce of 11,000 with a turnover of around €2.5 billion, 35 shipyards and twenty more companies in twenty nations: a list like this makes the Damen Shipyards Group based in Gorinchem/Netherlands a real force in European shipbuilding. And Damen's product range is just as impressive: from work boats and tugs (including the well-known "Shoalbuster" and "MultiCat" series) to ferries, naval ships and mega yachts.

All in all, the Damen Group built and delivered 143 ships in 2021. Another important business sector is ship conversion and modernisation.

Work is exceptionally varied at the company's Hardinxveld site where in 1927 the brothers Jan and Riem Damen founded the company as a small boat-building yard.

Maintenance, repairs, conversions of ships and the construction of new ships up to 90 metres in length are undertaken here. The site manufactures components for other sites in addition to building 14 to 16 work boats every year. This work is undertaken by the Damen Shipyards Hardinxveld business unit with some 100 employees who work at the Hardinxveld site.

Damen ships are renowned for their excellent durability and service life. This can be seen in a wealth of details, including the tubing of the many lines needed for the various hydraulic applications on work boats, such as winches and cranes. Whilst other shipyards have relied on detachable connections for many years now, Damen still preferred welded joints. Marcel De Bruin, Piping Manager at Damen Piping at Hardinxveld, was for many years an advocate of welding and sceptical about detachable tube connections:

"Of course welding is expensive, you need experienced specialists and it is less flexible when it comes to repairs or conversions. But a non-detachable, welded pipe connection practically lasts for ever."

From welding to detachable connections

The fact that Damen Piping was nevertheless looking around for an alternative in 2018 had a lot to do with the need for greater flexibility and a higher work rate. It was also linked to the realisation that highly reliable detachable connection systems were now available.

Damen Piping consulted the Netherlands-based hydraulics wholesaler JB Hydraulics about which detachable system to use. JB was already supplying the Damen site in Hardinxveld with a variety of Stauff hydraulic components (pipe clamps, fittings, measuring equipment). Thus cooperation was well established and it was clear to the JB Hydraulics experts that they should propose the Stauff Form Evo forming system – all the more so, as their experience with it had been positive in other applications.

Compared to the cutting ring concept for detachable hydraulic line connections, forming is judged to be the higher quality solution on account of its strength. In the Stauff forming system, the tube end is formed in such a way that a positive-fit sealed connection is formed when fitting "metal to metal" with a conventional fitting body and a union nut.

The only possible leak path with Stauff Form Evo, the second generation of the Stauff forming system, is addi-

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QUOTE

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Marcel De Bruin, Piping Manager at Damen Piping



Up to now, Damen has favoured welding for tube connections. However, now the shipyard has switched over to the Stauff Form Evo forming system.

tionally secured by the special-purpose Stauff Viton sealing ring. In the first generation, the sealing ring consisted of two materials, namely the metallic adapter ring and a fixed elastomeric seal.

The Stauff Viton sealing ring has been used since 2020, and is considerably less expensive as it is made of only a single material. This cost saving is appreciable for OEMs, such as Damen Shipyards, which fabricate large numbers of hydraulic tube connections.

| Safe thanks to superior tear resistance

The crucial argument for using Stauff Form Evo, particularly in safety-critical fields – including shipbuilding – has undoubtedly been its excellent tear strength, which offers considerable safety benefits under extreme conditions, such as strong pressure surges and vibrating loads. A further argument in favour of Stauff Form Evo is its DNV accreditation.

Stauff Form Evo is also impressive in terms of corrosion resistance, as all components are supplied as standard with a high-grade Stauff zinc/nickel coating. This coating provides reliable corrosion protection with over 1,200 hours of resistance to red rust or base metal corro-



Various Stauff connection and fastening technology products are used at the Damen Shipyard Group's Hardinxveld site.

sion in the salt spray test chamber (in accordance with DIN EN ISO 9227).

The requirements defined in the VDMA standard sheet 24576 for tube connections are still exceeded for the highest K5 corrosion protection class even after transportation, processing and installation of the components.

Damen considers the broad temperature range of -35 °C to 200 °C as an added bonus, as is the fact that Stauff Form Evo can be used within pressure ranges of up to 800 bar in the Heavy Series (with a four-fold safety factor).

Tube preparation workflows have been greatly simplified since the Hardinxveld tube experts switched over from welding to forming.

Marcel De Bruin: "Previously we had to prepare, weld, clean, X-ray and possibly rework the tubes, and then zinc-plate or paint them. Personnel outlay, processing times and costs were high.

We now simply measure the tube, saw it and deburr it. It is then bent and formed and can be directly installed."

| Saving time and money

Eight piping experts prepare around 8,000 hydraulic tubes for installation each year with the Stauff Form Evo machine, which is located in Hardinxveld. The machine is thus used for around 16,000 connection processes with tubes from eight to 42 mm in diameter – of which around 95% are steel tubes and 5% stainless steel tubes.

This "mixed use" is yet another benefit of Stauff Form Evo. Mark Kramer, Sales at JB Hydraulics: "The old Stauff Form system required different seals for steel and stainless steel tubes. The new Viton sealing ring works with both materials. The forming tools can also be used for the two materials. This saves time when it comes to changing tools." The operators are highly satisfied with the system and are even planning ahead.

Marcel De Bruin: "We are currently considering purchasing another Stauff Form Evo machine." (häu)

INFO

Kanban-based delivery

The Netherlands-based hydraulics wholesaler JB Hydraulics delivers the Stauff Form Evo components to the Hardinxveld shipyard using the Kanban method, as well as the cutting ring fittings used by Damen to connect fuel and lubricant lines. Marcel De Bruin, Piping Manager at Damen Piping at the Hardinxveld site, adds: "The Kanban service is really practical. We always have the connectors we need on site, almost automatically."