

### Rudder Link & Hinge system Refurbished

Job executing contractor: FA-Yard

Contractors Representative: Claus Schneider & Dan Larsen

Vessel: RoRo / Passenger Vessel

Customer representative: Vessel Superintendent

Report done by: Thomas Rosenkjær / Wencon ApS

Date: January 18<sup>th</sup> 2021

Type of repair: Rudder Link & Hinge system Service & Overhaul

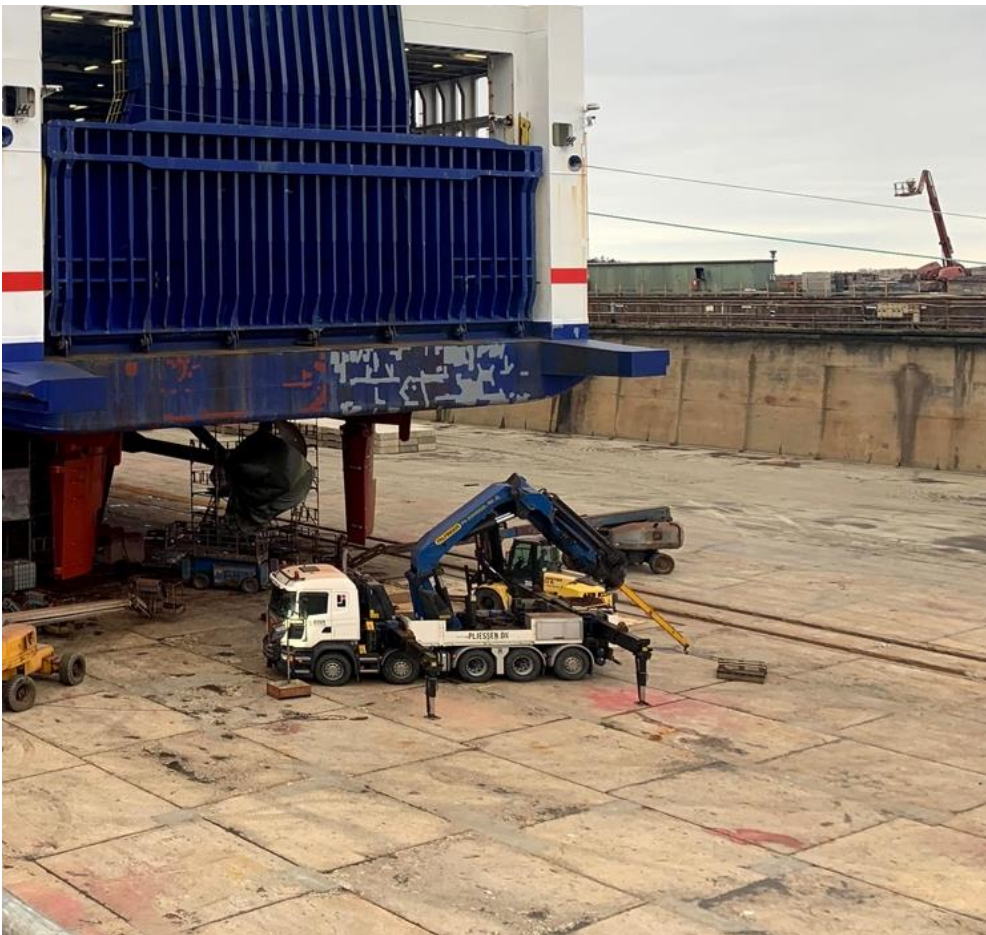
Appendices to this report: Wencon Certificate Claus Schneider, Products TDS & DNV/GL, ABS, Bureau Veritas & RINA Type Approvals

Products used

No. 1100 Wencon Cleaner.

No. 1010/1020 Wencon Cream & Rapid

No. 1020/1030 Wencon Coating White & Blue.



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Service description:

Refurbishment of Rudder Hinge System (Rudder & Rudder flap Hinge)

Thrust Rings cast to fit and sealed in fixed position.

Wear Rings cast to fit and sealed in fixed position.

Upper and Lower Link Bushing Cast to fit in-situ.

Link System (replaces in-situ machining)

Cast to fit fixation of upper & lower Bushings.

Bi-metallic corrosion has caused loose Thrust Rings and slack in the Link & Hinge system on the Rudder/Rudder flap.

The original fixing & casting compound degraded by bi-metallic corrosion, which is a well-known phenomenon that generates unnecessary challenges, and large maintenance costs.

Wencon products suitable for such tasks are based on Epoxy resins that do not contain corrosive fillers etc. and the problem will thus be excluded for the future.

For this job, various products have been used, one to support the Thrust Bearing, and one to cast a in the Bering Liner for the Link joint

Cast to fit, is a very time-saving repair and maintenance method which replace In-Situ machining and is associated with significant savings up the maintenance.

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1. The Rudder Flap in Workshop.

Thrust & Wear Rings to be cast and sealed in fixed position.



2. Rudder Flap Contact surface is prepared before casting and sealing using Wencon Cream.

Thrust & Ware Rings is fixed in the correct position by Hinge bushings.



3. Rudder Flap Thrust Ring cast and sealed in fixed position.

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4. Rudder Flap Wear Ring cast and sealed in fixed position.

Hinge Pin installed.



5. Wencon Cream applied on Rudder blade contact surface for Wear Ring.



6. Wear Ring installed in position on the Rudder Blade

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7. Rudder Flap installed - Upper Hinge



8. Rudder Blade installed – lower Hinge.



9. Upper and Lower Link Bushing housing are corroded, and Bushings became loose.

Here injecting holes drilled and threaded ready for installing bushings and inject Wencon Coating used as a casting compound.

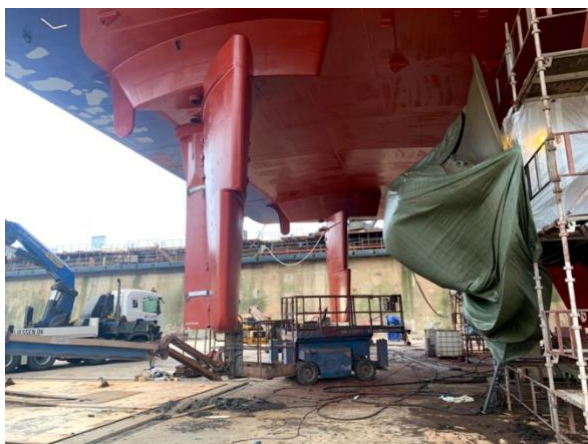
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10. New Bushings installed and bottom for the Clearance gap is sealed – ready for casting in the Bushing using Wencon Coatings.



11. Wencon Coatings injected by using an injecting hose drilled in the bottom of the Bushing to ensure level rises slowly by injecting and ensuring that no air entrapments are present in the finished result.



12. Rudder reinstalled with Flaps & Link Bushings.

Wencon Solution using Wencon's products by cast to fit method ensure a 100% fit and prevents water from penetrating between the bushing and housing contact surfaces.

Products are non-corrosive and future Corrosion risks are hereby eliminated. Time and money saved compared to traditional on-site machining and repair methods.