# Main Propulsion Propeller Blades- cavitation damage

Job executing contractor: FA-Yard

Contractors Representative: Claus Schneider & Bjorn Wienigk

Vessel: Multi Purpose Offshore Vessel

Customer representative: Vessels Superintendent

Report done by: Thomas Rosenkjær / Wencon ApS

Date: November 10th 2020

Type of repair: Repair of cavitation damage of 8 pcs. Main Propulsion Propeller Blades

Appendices to this report: Certificate Claus Schneider and Type of approvals on the product from DNV / LG, ABS, Bureau Veritas & RINA

Wencon Products used:

- 2 x No. 1100 Wencon Cleaner, ½ liter.
- 12 x No. 1016Wencon Ceramic Cream, 1kg

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## Service description:

8 pcs. Main Propulsion Propeller Blades suffering from cavitation locally, same location addressed on all 8 blades.

Cavitation is one of the most severe and damaging phenomenon metals can be exposed to.
The impact effect can be compared to continuously shot blasting on the same spot day in and day out, neither steel nor coating will permanent withstand such impacts.
Cavitation is the formation of steam cavity in a liquid - i.e. floating zones – which is a consequence of forces acting on the fluid.
This usually happens when a liquid is subjected to rapid changes in pressure which causes the formation of voids where the pressure is relatively low.
Upon exposure to higher pressure, the cavities implode which generate an intense shock wave.
Non-inertial cavitation is the process in which a bubble in a liquid is forced to fluctuate in size or shape due to energy supply, such as an acoustic field.
Such cavitation's is often observed in Propulsion areas and surroundings.

Under such conditions small vapor bubbles are created in the liquid, and within milliseconds after being created these bubbles implode against the substrate - This causes damages to the metal, composites etc.
Therefore, cavitation is extremely damaging to metals and to protective products in general, that within Wencon's product line as well.
In terms of solving the cavitation problem we postpone the cavitation damages to the metal by applying Wencon Ceramic Cream.
Basically, it prevents further damage to the metal, and the physical properties remain in the Propeller Blades as long the cavitation attacks the Ceramic Cream layers and herby postpone the cavitation in further weakening the strength of the metal.

Due to above mentioned facts, it is uncertain how long a Wencon application will last against Cavitation.
However, a Wencon application will postpone the cavitation attack to the steel significantly, but it's impossible for me to predict for how long.

# Main Propulsion Propeller Blades- cavitation damage

1. After disassembling the Propeller Blades, the surface is prepared using UHP Water Jetting to remove all salt and uncleanness's out if the metal surface.

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3. Measured salt content of the liquid before injection of the liquid into the patch – value 2.5 us/cm

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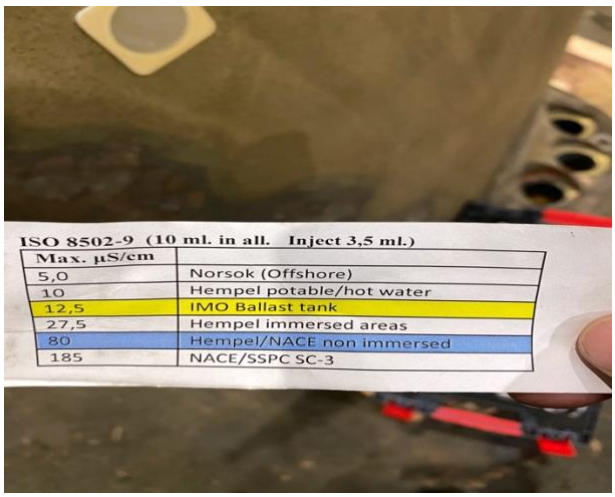
4. Measured salt content of the liquid after injection in patch x 5 times - value measured 6.9 us / cm




5. The final value: 2.5-6.9 = 4.4 us/cm.
   According to the most common standards as seen on picture on the left, it will meet even the toughest standards.

   Wencon recommendation in accordance to Norsok 5,0 us/cm.


6. Due to the extent of cavitation and damage to the propeller blades, the surface is already rough and suitable for applying Wencon Ceramic Cream.

   Grit Blasting seems therefore superfluous, and degreasing using Wencon cleaner will achieve the best conditions for proper adhesion.

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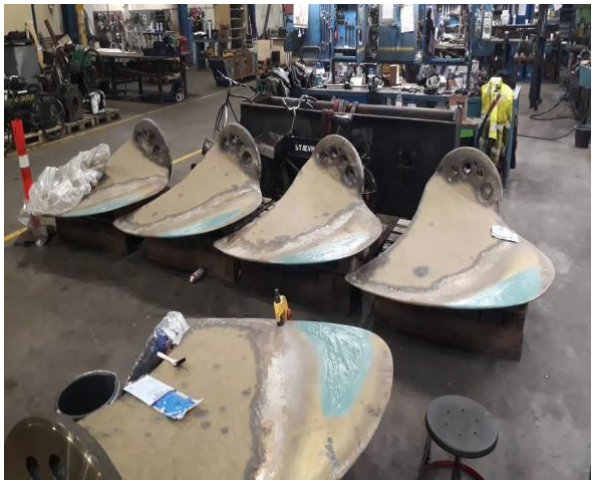
7. Cavitation damage on the Propeller Blade.

8. To optimize adhesion, the 1st layer Wencon Ceramic Cream are “worked toughly” into all pores and unevenness of the cavitated arias.

   It creates a mechanical adhesion beside the chemical bonding and herby the best adhesion possible is obtained.



9. 2nd and final layer of Wencon Ceramic Cream applied in layer thick enough to ensure level above to original surface has been obtained.

   Final curing occurs overnight and matching to original shape and Size can be executed just like working in metals.

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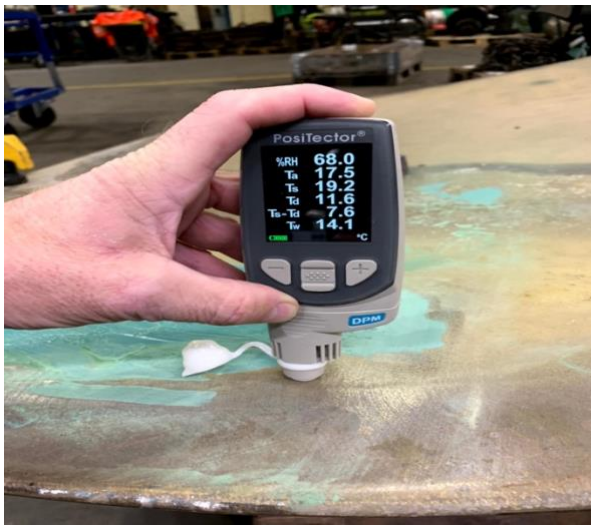


10. Throughout the complete application process, distance to the dew point is kept above 3ºC to ensure a dry surface to be applied to.

    Here a value of 7,6ºC distance to the dew point measure.

11. Subsequent to final curing has occurred, the original shape and size of the Propeller Blades is recovered by using grinding tools and ordinary polish tools as normally used to polish the Propeller Blades.

12. Final result.