

Z-Drive Repair Using Belzona 1111 and 5821

ID: 10231

Industry: Marine
Application: SOS-Ships and Offshore Structures

Customer Location: Seattle Area
Application Date: April 2023

Substrate: Carbon steel
Products: Belzona 1111 (Super Metal), Belzona 5821

Problem

The azimuth nozzle on a Z-drive propulsion system was experiencing cavitation erosion caused by the high-velocity turbulence generated by the propeller during normal operation. The carbon steel nozzle surfaces showed significant material loss across approximately 20 square feet of affected area, with pitting and surface irregularities characteristic of sustained cavitation damage in a seawater immersion environment. The combination of cavitation forces and the corrosive effects of saltwater service accelerated the rate of deterioration. If left unaddressed, continued material loss would compromise the hydrodynamic profile of the nozzle, reducing propulsive efficiency and eventually threatening the structural integrity of the assembly. A durable repair and long-term protective coating solution was required to restore the nozzle geometry and prevent recurrence.



Before



After Blasted



Belzona 5821 First Coat



Belzona 5821 Second Coat

Application Situation

Belzona was selected for this repair due in part to the requirement for a coating system that met low-VOC environmental compliance standards. Belzona products are 100% solids formulations with zero VOC content, satisfying regulatory requirements without the need for special ventilation or environmental permitting considerations. Additionally, Belzona's cold-applied repair method eliminated the need for hot work on the steel nozzle, avoiding the safety risks, fire watch requirements, and potential heat distortion associated with weld buildup in a marine maintenance environment. The vessel's maintenance schedule demanded a rapid turnaround to minimize time out of service, and Belzona's application and cure characteristics allowed the nozzle to be rebuilt and protectively coated within a single drydock window. The cold-cure, zero-VOC system offered clear advantages over traditional weld repair and conventional marine coatings in terms of both regulatory compliance and operational efficiency.

Application Method

The damaged carbon steel surfaces were abrasive blasted to SSPC-SP10 Near-White Blast Cleaning standard, achieving a minimum 3-mil angular surface profile suitable for mechanical adhesion of the Belzona system. Belzona 1111 (Super Metal) was then mixed and applied by spatula and gloved hand to rebuild the cavitation-damaged areas, restoring the nozzle surfaces to their original

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ISO 9001:2015
FS 695214
ISO 14001:2015
EMS 695213

Belzona products are
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profile and geometry. Once the rebuild was complete and had reached initial set, Belzona 5821 was applied as a protective immersion-grade coating over the rebuilt surfaces and surrounding substrate to provide long-term resistance to both cavitation and seawater corrosion. The total application time for the complete system was approximately four hours. All products were mixed and applied in accordance with Belzona's Instructions for Use (IFU's). The repaired nozzle was allowed a three-day ambient-temperature cure before the vessel was returned to service.

Belzona Facts

The zero-VOC, cold-applied nature of the Belzona system was the single most important factor in this project's success. It allowed the operator to perform a durable cavitation repair and apply a long-term protective coating during a tight drydock window, without the regulatory burden of solvent-based coatings or the safety and distortion risks of hot-work weld repair. The repair restored the nozzle to full service in under a week from start to finish.

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