Heat Exchanger Repair on Marine Engine

ID: 10318

Industry:	*Marine*	Customer Location:	*Seattle WA*
Application:	*ENC-Engines and Casings*	Application Date:	*July 2026*
Substrate:	*Cast Iron*		
Products:	*Belzona 1161 (Super UW-Metal)*		

Problem

The cast iron heat exchangers on a marine engine were found to have developed large cracks in the casing wall. The root cause of the cracking was undetermined at the time of inspection, though cast iron heat exchangers in marine service are commonly susceptible to thermal cycling stresses and freeze events that can initiate and propagate cracks through the brittle cast iron substrate. The cracking had compromised the integrity of the casing, creating the risk of cooling water leakage from the heat exchanger. Left unrepaired, continued operation would have risked coolant loss, engine overheating, and potential catastrophic engine damage. The cast iron substrate presented an additional challenge, as cast iron is difficult to weld reliably due to its high carbon content and tendency to crack further when subjected to the thermal stresses of welding. A cold-applied repair solution was required to restore casing integrity and return the engine to safe, reliable operation.



Before application



Crack shown



Belzona 1161 and Belzona 9341 being applied



Final application

Application Situation

Welding cast iron is inherently problematic — the high carbon content and brittle nature of the material make it highly susceptible to further cracking from the thermal stresses introduced during welding, even with extensive pre-heat and post-heat procedures. Full replacement of the heat exchanger would have required removing the unit from the engine, sourcing a replacement casting, and extended vessel downtime. Belzona 1161 (Super UW-Metal) was selected as a proven cold-applied solution for repairing cracked cast iron casings, eliminating all risk of heat-induced damage to the surrounding material. Combined with Belzona 9341 (Reinforcement Tape) to bridge and reinforce the cracked areas, the system provided a structural repair that restored casing integrity without any hot work. The repair was completed in-situ on the vessel in just 2 hours of application time, with the engine returned to full service within 24 hours — avoiding the significant cost and downtime that replacement or weld repair would have required.

Application Method

The damaged area of the cast iron heat exchanger casing was thoroughly cleaned using brake cleaner to remove all dirt, grease, and surface contaminants. The cracks had naturally vee'd out with sufficient surface area to allow full penetration of the repair material without the need for mechanical vee-ing. The entire repair area of 144 square inches was then prepared using a Bristle Blaster to achieve a near-white metal surface finish equivalent to Swedish Standard Sa 2½ with a suitable angular surface profile. Belzona 1161 (Super UW-Metal) was mixed and applied directly to the prepared surface using the spatula provided, pressing firmly into the

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cracks and roughened profile to displace air and ensure maximum surface contact. Belzona 9341 (Reinforcement Tape) was wetted out with mixed Belzona 1161 and bedded down over the cracked areas to provide structural reinforcement across the repair. Additional Belzona 1161 was applied over the reinforcement tape to achieve a buildup of approximately 1/8 inch (3 mm) over the entire repair area, and the surface was contoured to the correct profile. All work was performed in accordance with Belzona's Instructions for Use (IFU's) and the Belzona ENC-1 Know-How guide for repairing damaged casings. Total application time was approximately 2 hours, with full mechanical cure achieved within 24 hours.

Belzona Facts

Cast iron is notoriously difficult to weld without inducing further cracking, making a cold-applied repair the ideal solution for this application. Belzona 1161 with Belzona 9341 reinforcement restored full casing integrity in 2 hours of application time with no hot work, no risk of thermal damage to the casting, and the engine was back in service within 24 hours.

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