Signature Management Case Study

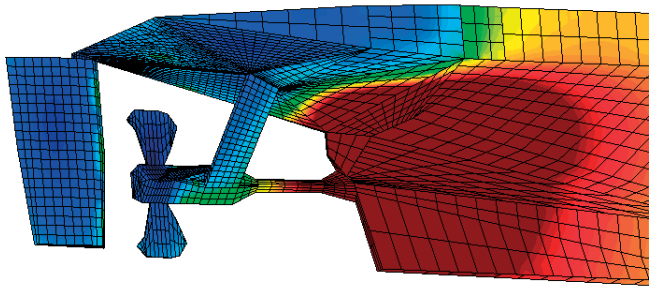
Underwater Electric and Magnetic Signature Prediction

The Challenge

The challenge is to estimate and optimise a naval vessel's Total Underwater Electric and Magnetic (UWEM) signature profile, and provide robust countermeasures system designs to meet UWEM signature goals applied to naval vessels.

The Solution

This solution was achieved by modeling each major contributing component of the total underwater magnetic signature using the BEASY Corrosion & CP software and the BEASY CRM tools. Optimization techniques were applied to create a robust countermeasures system designs, specifically the techniques used in ICCP system design for signature management.
The influence of the signature created by the rotating propeller shaft on the electric and magnetic field and the impact on the surrounding electric and magnetic field was also predicted.

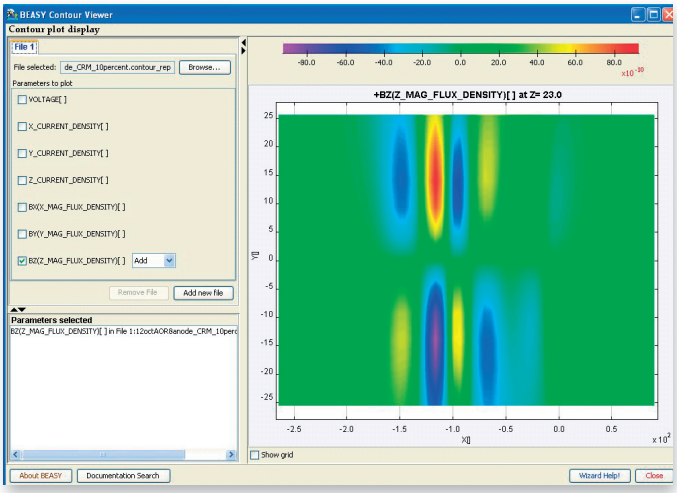


The Value

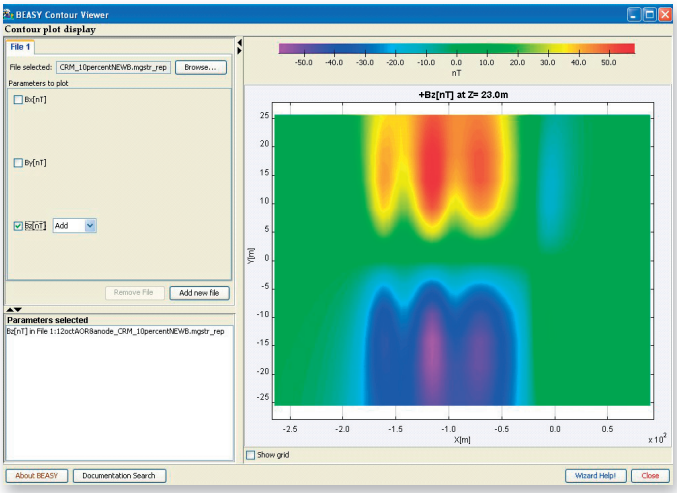
The results of the signature analysis was that the Magnetic Signature (alternating and static) Components met the limits for magnetic signature applicable to ships used in support roles. At the same time the Electric Field Signature (Static and Alternating) components were minimized to levels considered safe for the threats assumed for the fleet support missions that the vessel was designed to carry out.

BEASY
Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK
Tel: 44 (0) 238 029 3223
Fax: 44 (0) 238 029 2853
Email: info@beasy.com
On the Internet: www.beasy.com

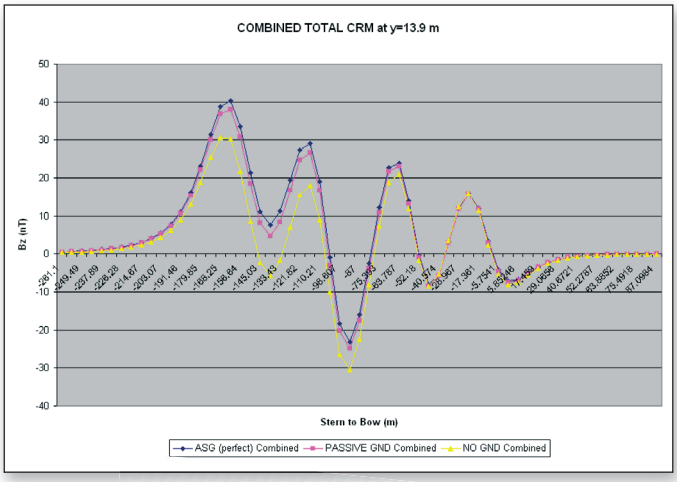
BEASY
25 Bridge Street, Billerica, MA 01821, USA
Tel: 978 667 5841
Fax: 978 667 7582
Email: info@beasy.com
On the Internet: www.beasy.com



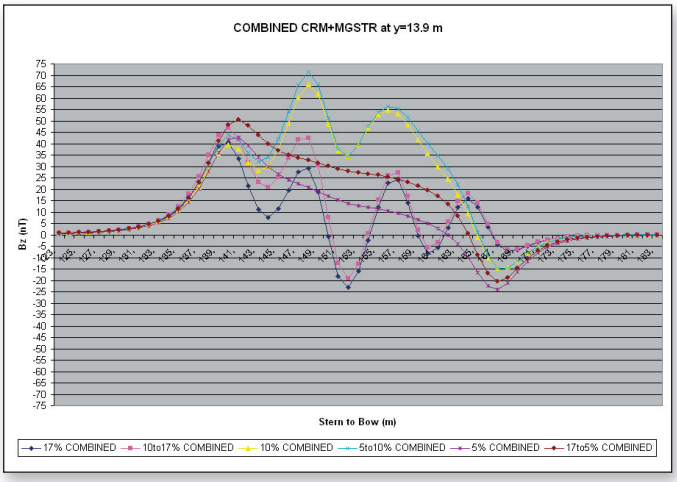
Corrosion Related Magnetic (CRM) Signature due to currents in seawater



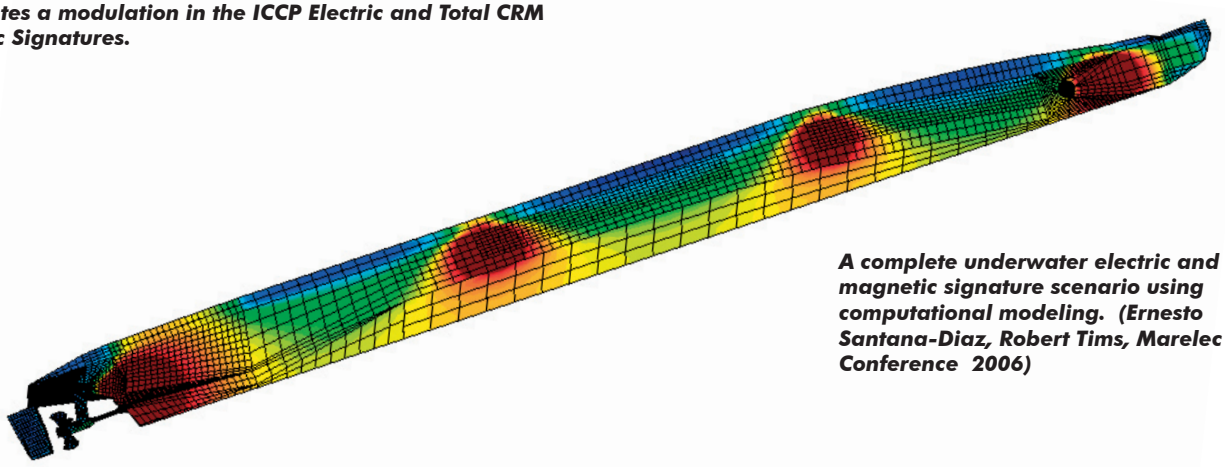
Hull Structure Magnetic Signature due to currents returning through the hull structure



As the propeller shafts rotates, the resistance between the propeller shaft and the hull modulates, which modulates the return current from the propeller to the hull and anodes. This creates a modulation in the ICCP Electric and Total CRM Magnetic Signatures.



Combined CRM and Structure Magnetic signatures with ICCP on for different damage scenarios.



A complete underwater electric and magnetic signature scenario using computational modeling. (Ernesto Santana-Diaz, Robert Tims, Marelec Conference 2006)

BEASY
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