Aish Technologies

World Leader in Low Signature Cathodic Protection

SURVIVE

- Advanced Corrosion Protection
- Stealth
- Increased Survivability, Operability and Availability
- Reduced Though Life Costs

The world's first... still leading

In the mid 1980's the electronic and magnetic signatures associated with conventional impressed current cathodic protection (ICCP) systems were targeted for reduction, and Aish Technologies was the first company in the world to equip a submarine class with a system that not only provided automatic corrosion protection, but also addressed corrosion-related signatures. Three classes of modern submarine (two in the US Navy and one in the UK Royal Navy) are now in service with Aish Technologies low signature ICCP systems.

Reducing Corrosion Related Signatures

Alternating Signatures

The first corrosion-related signatures to be addressed were the Power Frequency ELFE (Extremely Low Frequency Electromagnetic) effect resulting from anode power supply ripple, and the Shaft Related ELFE caused by modulation of protection currents at the stern. A combination of Aish Technologies extremely low ripple anode power supplies and an active shaft grounding system reduces these alternating corrosion-related signatures to negligible levels.

Static Signatures

Reduction of static corrosion-related signatures (Underwater Electric Potential and Corrosion Related Magnetic) is known as 'deamping'. This needs to be considered very early in the design of any class of vessel in order to optimise the layout of anodes and reference electrodes for signature reduction and corrosion protection, while being compatible with other important facilities both inside and outside the hull. (eg fuel tank and sonar locations). Aish Technologies can work with computer modelling and/or physical scale modelling facilities around the world to achieve this.

Once optimum layout has been achieved, Aish Technologies' two families of ICCP system (Aish *C3P* and *Series 300*) can be used for **open-loop deamping**, whereby the minimum signature achieved at new build can be maintained by adjustment at periodic rangings. The computer-controlled Aish *C3P* family can also be used for **closed-loop deamping**, where data such as seawater conductivity and ship's speed can be combined with the ICCP data to provide a prediction of present signature and allow automatic adjustment of it. The control algorithm for this process can have a classified nature, so Aish Technologies software is arranged so that a locally generated algorithm can be 'bolted in' in the country of use.

ICCP versus Sacrificial Anodes

The advantages of ICCP versus sacrificial anode protection are well-known. Eliminating the necessity to dry dock regularly to replace sacrificial anodes not only reduces through-life costs, but also increases a vessel's operational availability. Moreover, flush mounted ICCP anodes eliminate both the drag associated with sacrificial anodes, and the acoustic signature generated by the turbulence that they cause.

In ballast tanks and below casings sacrificial anodes are perceived as the safer option because hydrogen gas generation resulting from their operation is inherently low. Aish Technologies' Low Voltage ICCP technology (Patent Pending) will, however, provide the same through-life cost advantages over sacrificial anodes in these difficult areas without generating hydrogen gas. Aish Technologies plans to demonstrate this new technology during 2010.

In summary...

Aish Technologies systems can play a major part in reducing a vessel's detectability both on open water and in the littoral, as well as enabling increased operability in mined areas. And all this, of course, while automatically keeping corrosion at bay

Aish Technologies systems provide:

- **Advanced Corrosion Protection**
- **Stealth**
- **Increased Survivability, Operability and Availability**
- **Reduced Though Life Costs**

Power Frequency ELFE

Threat

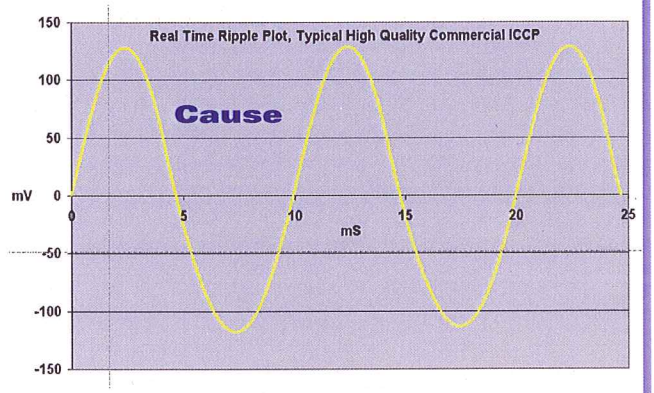
Triggering of mines in littoral waters.

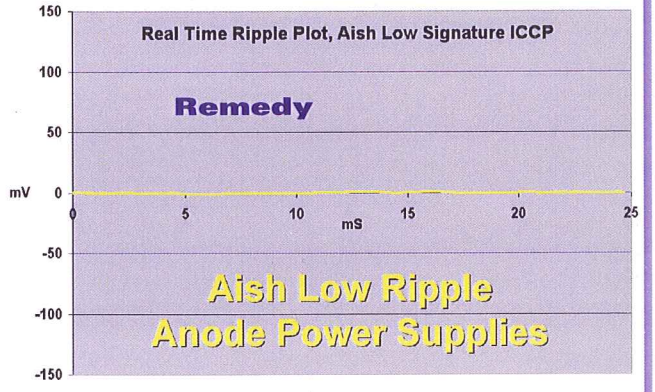
Cause

The outputs to the anodes of a conventional ICCP system may have a voltage ripple superimposed on the DC. This is fixed frequency, so is easily detectable.

Remedy

Use very low ripple power supplies.

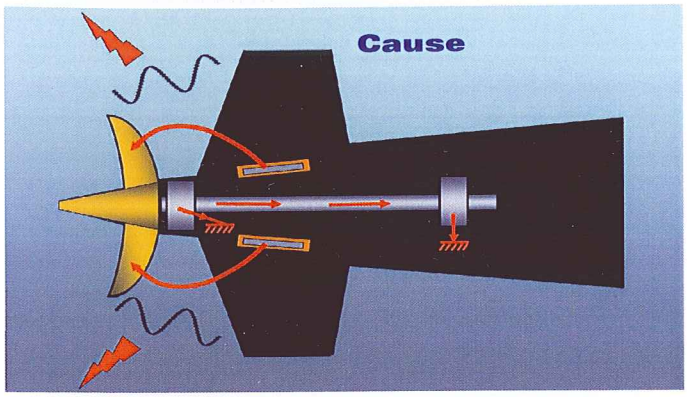




Shaft Related ELFE

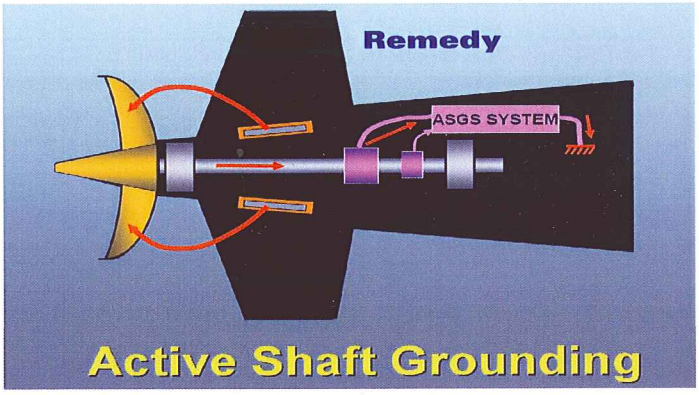
Threat
Triggering of mines in littoral waters.

Cause
Anode currents protecting the stern may be modulated by variation in the resistance between hull and shaft as it rotates.



The modulation has a limited frequency range related directly to shaft rotation speed, so it easily detectable.

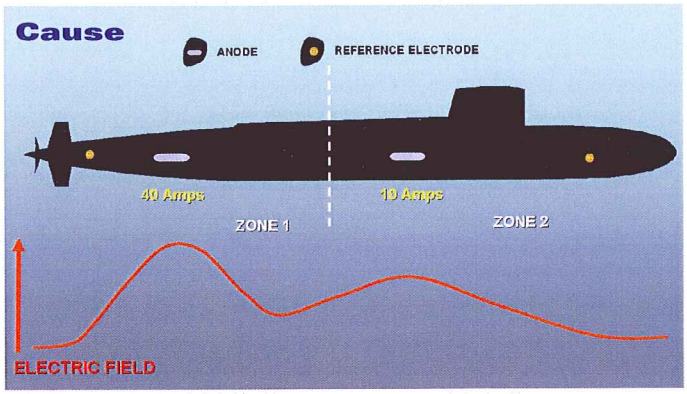
Remedy
Ensure that the resistance between hull and shaft is maintained at a constant very low level using an active shaft grounding system (ASGS)



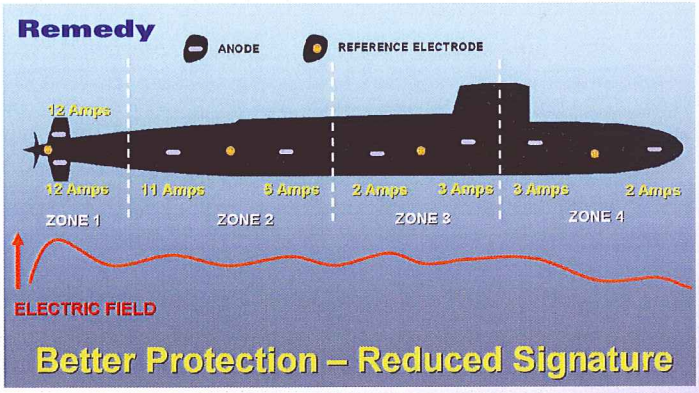
Underwater Electric Potential

Threat
Detection, and triggering of mines in littoral waters

Cause
Underwater Electric Potential gradients exist wherever electric currents are flowing in seawater

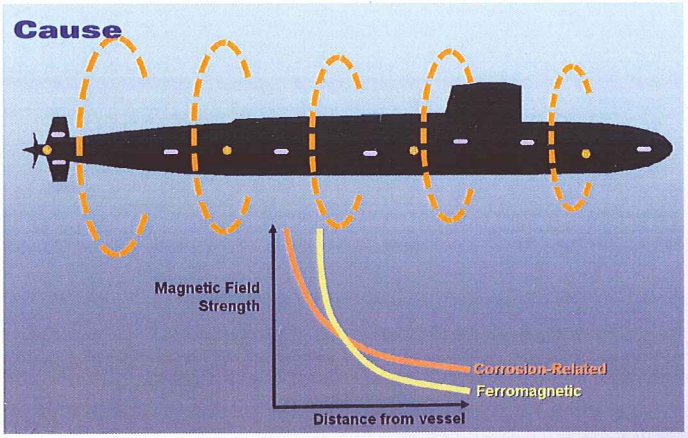


Remedy
Use multiple anodes at lower voltages, and optimise layout using modelling



Corrosion Related Magnetic

Threat
Submerged submarines can be tracked from the air using Magnetic Anomaly Detection equipment

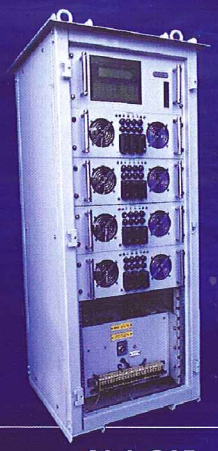


Cause
Electric currents cause a magnetic field around the vessel. Can be greater that the ferromagnetic field at distance

Remedy
Optimise by modelling and use computer controlled ICCP to manage signature ('Deamping')

The perfect fit

All our systems are designed and manufactured in-house and are tailored to provide an optimum cost-effective design for each platform. This table provides a general comparison between the Aish*C3P* and *Series 300* families.



	Aish*C3P*	Aish *Series 300*
Wide range of Low Ripple Anode Power Supplies (5-200A)	Yes	Yes
User-friendly Interface with easy visibility of all parameters.	Yes (Flat Panel Display)	Yes (Mimic)
Control to +/-1mV at controlling electrode	Yes	Yes
Zone capability (from one controller)	50+ Zones 100+ Anodes 100+ Reference Electrodes	5 Zones 16 Anodes 10 Reference Electrodes
Automatic Data Logging	Yes	Optional
Individual anode control	Yes	Yes
Manual control override	Yes	Yes
Compatible with wide range of Anodes	Yes	Yes
Control from high quality Silver/Silver Chloride Reference Electrodes	Yes	Yes
Interface with 3rd party software (for closed-loop deamping)	Yes	Limited
Automatic Reference electrode changeover if an Electrode fails	Yes	Yes
System is modularized and can be split up to fit available space(s)	Yes	Yes
Individual Back-EMF measurements (to check state of anodes)	Yes	Yes
Immediate trip if overprotection is detected (to avoid hydrogen embrittlement)	Yes	Yes

More low signature ICCP systems in service than any other supplier

Aish Technologies

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