

**Seawater pipework anti-fouling systems
ICCP hull corrosion protection systems**

Specialised protection for military vessels



Cathelco 

Seawater pipework anti-fouling systems

The effectiveness of Cathelco seawater pipework anti-fouling systems has been proved on the ships of more than 40 navies worldwide. With the advantages of easy installation, safety and minimum attention in operation, the system eliminates blockages caused by bio-fouling in seawater lines.



Frigates

Systems on frigates usually involve a combination of seachest and strainer mounted anodes. As with most military vessels, the pipework is predominantly cupro-nickel and therefore pairs of copper and ferrous anodes are used to provide effective anti-fouling and corrosion suppression. Standard Cathelco control panels can be used as they meet the levels of shock and vibration resistance required by naval authorities. Recent contracts for frigates and warships include equipment for the BAM project in Spain, PVO and BVL projects in Venezuela and the FREMM project involving the Italian and French Navy.

Aircraft carriers

These installations involve the treatment of large volumes of seawater using multi-anode installations serving numerous inlets covering the requirements of engine cooling water systems, refrigeration, air conditioning and fire fighting systems. Cathelco are proud to have supplied equipment for the HMS Queen Elizabeth and HMS Prince of Wales, the Royal Navy's two new 65,000 tonne aircraft carriers.

Fast patrol craft

Cathelco have considerable experience in the design of pipework anti-fouling systems for fast patrol craft where space is at a premium. These vessels generally have a number of small inlets which can be protected with compact dual purpose anodes, consisting of copper/aluminium or ferrous elements in a single assembly. Alternatively, miniaturised Nano anodes can be fitted in strainers. The Cathelco Mini and Nano control panels ensure that systems can be installed in the tightest areas within engine rooms.

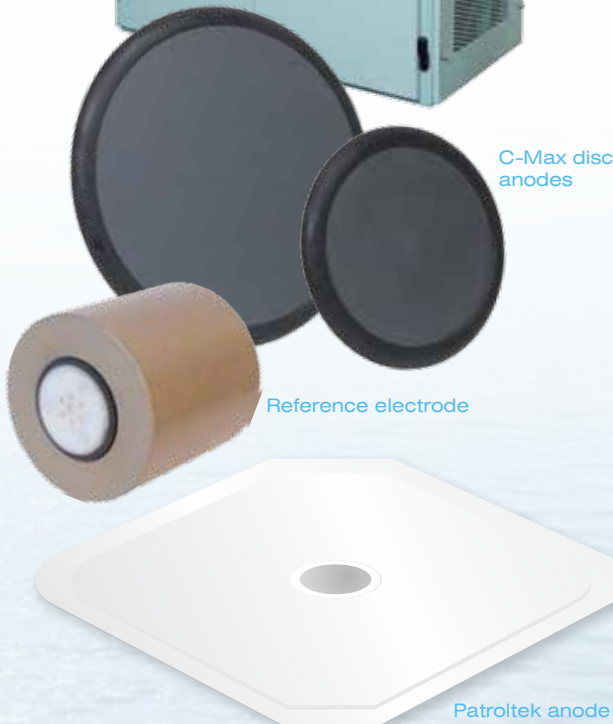
Submarines

The Cathelco system was originally designed for use on submarines and the company regularly supplies anti-fouling equipment to some of the world's leading builders of submarines including Kockums, HDW, TNSW and the Australian Submarine Corporation. Because of space restrictions within strainers, installations are usually based on compact dual purpose anodes. Systems are often specially designed to meet the exact requirements of particular classes of submarines.



ICCP hull corrosion protection systems

The combined resources of Cathelco and Corrintec Marine enable all types of naval vessels to be protected from corrosion. Both steel and aluminium hulls can be protected using ICCP systems which are carefully controlled to optimise the level of output.



C-Max disc anodes

Reference electrode

Patroltek anode

I-Shield – the intelligent ICCP system

Cathelco has made a major advance in ICCP technology with the development of I-Shield, the intelligent system for naval vessels. Warships require specialised ICCP systems which prevent hull corrosion, but do not interfere with the electrical war-fighting capability of the ship. The I-Shield system is specifically designed to meet the stringent requirements of EMC/EFI, shock, vibration, low maintenance and flexibility of operation in the military environment.

- Multi-zoned system for optimum corrosion protection.
- Low electro magnetic signature with ultra low ripple power supply.
- Driven by mathematical model for greater effectiveness.
- Accurate control with ability to maintain controlling reference electrode with $\pm 5\text{mV}$ of set mV point.

Patroltek ICCP systems for fast patrol craft

Due to their operational characteristics, fast patrol craft create high levels of turbulence in the stern area. This raises the level of oxygen in the water which leads to increased corrosion rates. Patroltek automatically compensates for the variations in operational conditions, ensuring the hull receives the optimum level of protection from corrosion at all times.

- Recessed anodes and reference cells maintain a smooth hull profile.
- System provides optimum protection at any speed.
- Shaft grounding assemblies available to earth propeller to hull – prevents bearings from pitting.
- Built to AQAP1 and NATO quality assurance procedures for military applications.
- In-built anti-shock and anti-vibration mounts to withstand operating conditions of a high speed craft.
- Master and slave power unit arrangement is available.



Bespoke solutions for military vessels

Cathelco can supply bespoke ICCP systems for naval vessels with sophisticated data logging and the ability to control multiple units from one location.

The C-Nexus controller has numerous features which ensure that corrosion protection is precisely controlled on steel hulls, aluminium hulls and waterjet units and can be used in conjunction with Thyristor, Minitek, Alutek, Jettek systems.

- Advanced controlling and monitoring features for complex anode/reference electrode arrangements.
- Comprehensive information systems.
- Data logging of alarm conditions.
- Ability to export data to bridge information systems.
- Enables system to be remotely monitored via Ethernet connection



Alutek Systems

Compact and versatile, these systems are used to protect aluminium hulled craft against corrosion. Used in multiple units they are also ideal for corrosion protection on catamarans. In addition, Alutek systems provide the solution to waterjet corrosion problems.



Naval Reference List

ALGERIA

8 Fast Patrol Craft
2 Landing/Logistics Ships
1 Corvette

ARGENTINA

3 'Salta' Class Type 209
2 Type 42 Destroyers
Submarines

AUSTRALIA

4 'Oberon' Class Submarines
6 Collins Class Submarines

BELGIUM

4 Frigates

BRAZIL

6 MK 10 Frigates
2 209 Type Submarines
3 Offshore Patrol Vessels

CANADA

3 Coast Guard Patrol Vessels
4 Coast Guard Icebreakers
1 Coast Guard Survey Vessel
2 Training Vessels
1 Nav Aids Vessel
5 Frigates
3 Minesweepers
1 Destroyer
4 Type 1100s
1 Type 1050, NPB

CHILE

2 Leander Class Frigates
4 Type 22 Frigates
3 Type 23 Frigates
3 M Class Frigates
2 'Oberon' Class Submarines
1 Support Vessel

CHINA

12 Police/Customs Patrol Vessels

COLOMBIA

2 Type 209 Submarines
4 Corvettes

DENMARK

3 Support Ships

EGYPT

6 Fast Patrol Boats

FRANCE

11 Multi-Mission Frigates
1 Support Ship
1 Mistral Class Multi-Role Vessel
Barracuda Class Submarines

GERMANY

4 Corvettes
2 Frigates
6 Submarines

GREECE

8 'Glavkos' Type 1,000 Ton
Submarines
4 Water Carriers
3 HDW Submarines

INDIA

4 HDW Type 209 Submarines
3 Frigates
4 Corvettes
2 Survey Vessels

INDONESIA

2 Type 209 Submarines
4 Corvettes

IRAN

4 Mk 5 Destroyers
4 Logistic Support Vessels

IRELAND

1 Patrol Vessel

ITALY

6 Anti-Submarine Frigates
2 Maestrale Class Frigates
1 Survey Vessel
1 Helicopter Carrying thru Deck
1 Cruiser
2 Destroyers

KENYA

5 Fast Patrol Boats

KOREA

4 Type 209 Submarines

LIBYA

1 Mk 7 Frigate

MALAYSIA

14 Fast Patrol Boats
4 Corvettes
2 209 Type Submarines

MALTA

1 Coastal Patrol Boat

MEXICO

31 Fast Patrol Boats

MOROCCO

1 Multi-Mission Frigate

NETHERLANDS

2 'M' Class Frigates
1 Fleet Auxiliary (AOR)
4 LCF Frigates
4 Walrus Class Submarines
1 Hospital/Troop Carrier

NEW ZEALAND

2 Leander Class Frigates
1 Survey Vessel

OMAN

10 Fast Patrol Boats
2 Logistics Support Vessels
3 Offshore Patrol Vessels

PAKISTAN

Patrol Vessels

PERU

4 Type 209 Submarines

PHILIPPINES

2 Patrol Craft

QATAR

4 Fast Patrol Boats

ROYAL NAVY

10 Polaris Carrying Nuclear Submarines
3 'Porpoise' Class Conventional
Submarines
3 Through Deck Cruisers
11 Type 42 Destroyers
16 Leander Class Frigates
20 Type 21 Frigates
4 Type 22 Frigates
17 Type 23 Frigates

2 Assault Ships
1 Air Training Ship
2 Special Operations Ships
1 Helicopter Support Ship
9 Survey Ships
1 Minelayer
10 Replenishment Ships
6 Logistic Support Ships
1 Replenishment Tanker
2 Survey Vessels
HMS Queen Elizabeth (Aircraft Carrier)
HMS Prince of Wales (Aircraft Carrier)

RUSSIA

2 Mistral Class Multi-Role Vessels

SINGAPORE

2 Type VGD Submarines

SOUTH AFRICA

3 HDW Submarines
1 Survey Vessel

SPAIN

4 Support Vessels
4 BAM Frigates

SWEDEN

1 Submarine
4 Riken Type Submarines

TAIWAN

4 Fast Patrol Craft

THAILAND

3 Corvettes

TURKEY

4 Type 209 Submarines
4 HDW Submarines

USA

Diligence (MSC)
Cape Decision (MSC)
Catawaba (MSC)
Narangasset (MSC)
Mohawk (MSC)
Observation Island (MSC)
Kiska (MSC)
Sioux (MSC)
Navajo (MSC)
USCGC Haddock
USCGC Tern
USCGC Shrike
USCGC Coho
USCGC Amberjack
USCGC Cobia
USCGC Chinook
USCGC Marlin
USCGC Harry Claiborne (Buoy Tender)
4 Research Vessels
X Craft (Seafighter)
2 Mobile Landing Platform Vessels
2 Littoral Combat Vessels
4 Joint High Speed Vessels

VENEZUELA

2 209 Type Submarines
4 Corvettes
2 Frigates
3 Littoral Support Vessels
3 Offshore Patrol Vessels

MISCELLANEOUS

1 British Antarctic Survey Vessel



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