CATHODIC PROTECTION CO LIMITED

CUPRION®

MARINE ANTI-FOULING SYSTEM

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Contents

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CUPRION® Anti Fouling - Overview

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CUPRION®

MARINE ANTI-FOULING SYSTEM

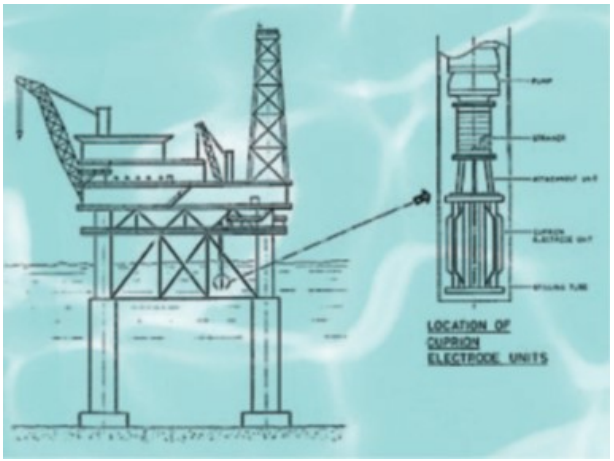
Cathodic Protection Co Ltd has manufactured and supplied the electrolytic Cuprion® marine anti-fouling system since the early 1970's to protect pumped sea water systems against marine growth. Today, the system is used by many of the major oil and gas offshore operators to protect vertical sea water and fire water pumps on platforms. Other applications include jetty fire pumps and sea water intake systems.

Benefits of the Cuprion® Anti-Fouling System Include:-

- Reduction in power requirements over alternative methods for fouling control.
- Low maintenance system
- Low power requirement
- No handling or storage of chemicals required
- Environmentally acceptable

SYSTEM DESCRIPTION

The method is based upon the use of impressed current on copper and aluminium anodes which are themselves contained within an insulated steel frame which forms the cathode. The anode/cathode electrode unit is suspended from the pump motor base within the confines of the caisson so that all the water entering the pump must pass the electrode unit. The Cuprion® system consists of two parts – the electrode unit and control panel. The electrode contains a number of copper and aluminium anode bars held together in a steel frame to form the cathode. The actual number and size of the anodes is configured to suit each installation and available space for mounting the electrode unit. The anodes are connected to the constant current rectifier located within a safe area. The control panel is designed to regulate the anode currents in both 'pump on' and 'pump off' condition, so that during the pump standby condition an atmosphere of copper ions in the local environment will maintain the pump free from fouling. This feature is particularly useful for installation on fire pumps that are generally operated for a short period each week. Dosage levels of copper ions are extremely small and measured in micrograms per litre of seawater. Therefore, relatively small quantities of copper are required to provide protection dependent upon the flow rate and life required.



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MARINE ANTI-FOULING SYSTEM

APPLICATION FOR SUBMERGED PUMPS

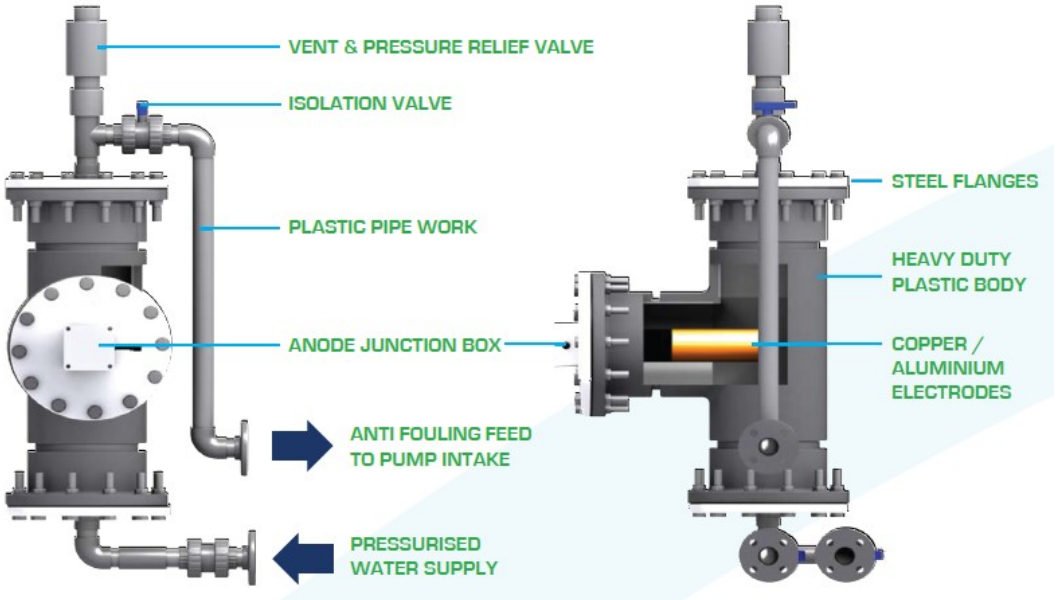
With extensive experience in the design of Cuprion® systems and provide anti fouling equipment for a wide variety of applications including:

- Offshore sea water lift pumps
- Offshore fire water lift pumps
- Jockey pumps
- Jetty fire water pumps
- Industrial sea water cooling systems

DECK MOUNTED OPTION

For some applications traditional method of pump / electrode configuration may not be suitable. As an alternative we offer the deck mounted system.

With the deck mounted Cuprion® anti-fouling system the anodes are located inside an tank through which sea water is fed from the main sea water system. As the water passes through the tank the carefully controlled anode currents ensure that the correct dosing level is applied for the particular application. The treated water is then piped down directly to the pump suction. In this way several pumps can be protected against fouling from a single treatment source. The Deck Mounted Cuprion® System is ideally suited for retro-fitting where the pump / electrode configuration may not be possible.



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CUPRION® Anti Fouling - Ships & Marine Vessels

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CUPRION®

MARINE ANTI-FOULING SYSTEM

SHIPS & MARINE VESSELS

Biofouling of water intake pumps and pipework on offshore platforms can be a major problem, causing expensive equipment damage and pipework blockages, leading to shut down of vital seawater supplies.

In the case of fire water systems crew safety and structure integrity must be considered. In addition, repairs to damaged pumps and pipe work are both costly and time consuming.

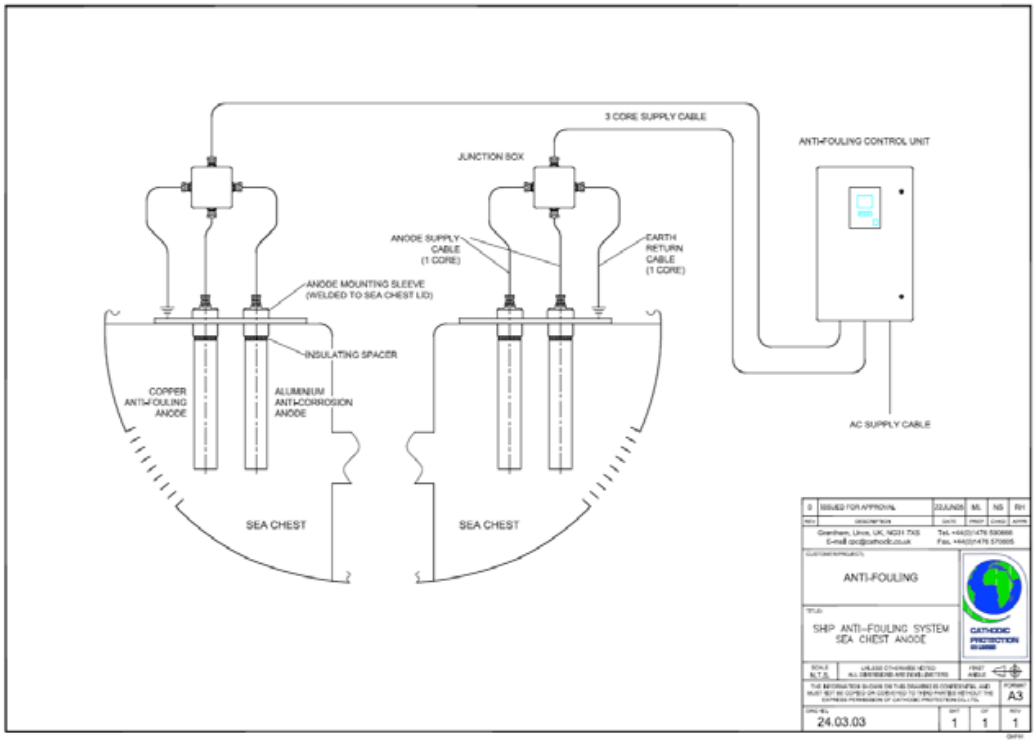
Chief Engineers would consider any remedial actions involving pipe section removal, repair, cleaning and re-installation as major refurbishment work on any operating marine craft or vessel.

CUPRION® - THE SOLUTION

Cathodic Protection Co. Limited (CPCL) has developed a range of CUPRION® anti-fouling systems to protect submerged pumps, seawater intakes and associated pipework against marine growth. Originally the CUPRION® system was developed and utilised for North Sea applications during the early 1970's.

The CUPRION® system is listed on Article 95 of the EU Biocides Regulation (528/2012) which came into effect on 1st September 2015, ensuring CPCL is legally entitled to place the CUPRION® system on to the European market.

Developing the system for use on ships and marine vessels involved changes to hardware and installation methods. Design requirements remained unchanged as CUPRION® operates on proven electrolytic principles



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CUPRION®

MARINE ANTI-FOULING SYSTEM

SHIPS & MARINE VESSELS

Marine growth prevention is achieved by employing a small d.c. current flow (generally less than 0.5 kW). This current flow energises copper and aluminium anodes to produce a fully effective, anti-foulant dosing solution. Selected dosing levels vary slightly to suit location and application, however maximum dosing limits utilised for design purposes are 24 µg/l and 4 µg/l for copper and aluminium respectively.

Copper is a natural biocide and provides complete protection from marine growth with no adverse environmental impact.

Aluminium anodes produce aluminium hydroxide, which combines with the copper ions holding them in solution, keeping pipe work blockage free. Aluminium hydroxide also helps arrest corrosion on internal pipe surfaces.

Where space or weight restrictions are design considerations, CPCL has developed systems that can be mounted above or below deck. These systems utilise an electrolysis tank and dosing spool.

The CUPRION® anodes are simply mounted in the electrolysis tank or CAnDU dosing spool and energised to produce anti-foulant solution, which is delivered via suitably rated pipes or hoses. Several seawater intake systems can be protected against marine growth from a single source.

Electrolysis tanks are generally mounted on a steel plinth along with the d.c. power unit, making the complete system integral, ideal for maintenance operations.

The CAnDU dosing unit can be mounted vertically or horizontally in any accessible, convenient location. Electrodes take around 30 minutes to replace whilst at sea or in a dry dock on these easy to maintain and flexible Anti-Fouling systems.

CUPRION® - IN THE MARINE INDUSTRY

CUPRION® systems have been installed on all types of ships & marine vessels. Indicative list below.

Vessel Details	Country	Client	Details
MPI Adventure & Discovery WTIV	UK	MPI Offshore	CUPRION® Deck system for cooling water
FPSO Support Vessels	UAE	Lamnalco	Engine cooling and fire fighting systems
60 m AHTS	Thailand	Mermaid Maritime	Central cooling system
40 m Ferry Boat	Croatia	Divcom d.o.o.	Forward & aft sea chests

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CUPRION® Anti Fouling - Fire Water Pump Systems

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CUPRION®

MARINE ANTI-FOULING SYSTEM

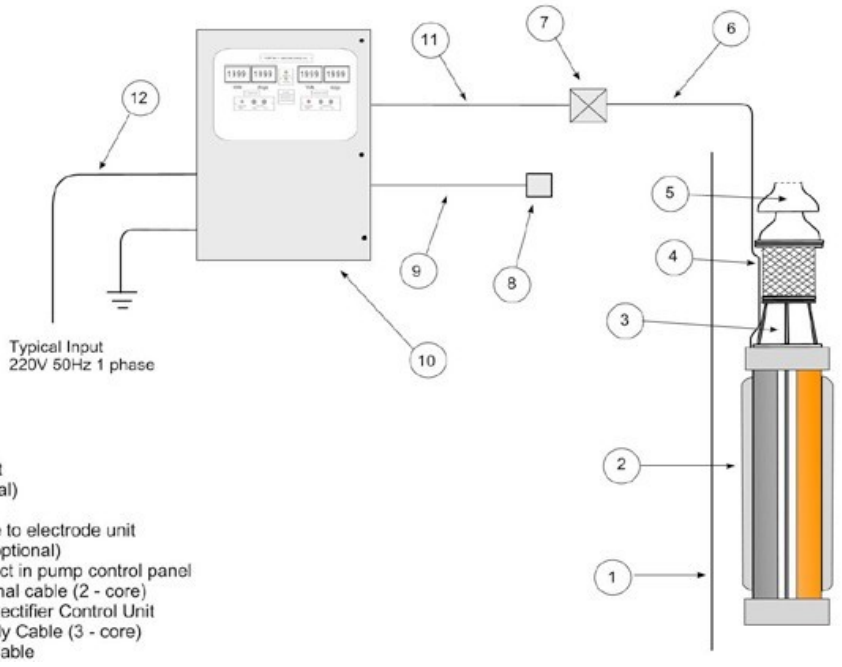
FIRE WATER PUMP SYSTEMS

NFPA 20—CUPRION® STANDARD RANGE

Cathodic Protection Co. Limited (CPCL) has developed a standard range to suit National Fire Protection Association directives in NFPA 20 – Standard for the installation of stationary pumps for fire protection. The selector chart overleaf indicates the range of CUPRION® systems available to suit NFPA 20.

The CUPRION® system is listed on Article 95 of the EU Biocides Regulation (528/2012) which came into effect on 1st September 2015, ensuring CPCL is legally entitled to place the CUPRION® system on to the European market.

NFPA 20—CUPRION® SCOPE OF SUPPLY



1 Stilling Tube
2 Electrode Unit
3 Attachment Unit
4 Strainer (optional)
5 Pump
6 EPR/CSP cable to electrode unit
7 Terminal Box (optional)
8 Volts free contact in pump control panel
9 Pump Start Signal cable (2 - core)
10 Transformer / Rectifier Control Unit
11 Electrode Supply Cable (3 - core)
12 Power supply Cable

NOTES.

Items 2, 3, 6, 7, 8 &10 provided by CPCL, remainder by others. CPCL can provide Items 4, 9, 11 & 12 upon request and receipt of relevant information.

Standard control unit utilises a GRP or mild steel coated IP45 enclosure suitable for indoor installation, other specifications available upon request.

Electrode unit cable tail employs multi-stranded, tinned copper conductor, CSA to suit current output.

System typically available in 12 weeks (ex-works) from approved documents/purchase order depending on client requirements,

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MARINE ANTI-FOULING SYSTEM

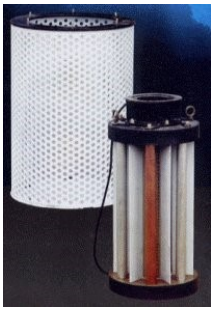
FIRE WATER PUMP SYSTEMS

NFPA 20 – CUPRION® SYSTEM SELECTOR

Flow Rate		Electrode Life (Years)	Electrode Weight (kg)	CUPRION® System I.D. Code
US gpm	L/min			
25	95	10	45	NFPA - 0025 - 10
50	189	10	45	NFPA - 0050 - 10
100	379	10	45	NFPA - 0100 - 10
150	568	5	45	NFPA - 0150 - 05
200	757	5	45	NFPA - 0200 - 05
250	946	5	45	NFPA - 0250 - 05
300	1,136	5	45	NFPA - 0300 - 05
400	1,514	5	60	NFPA - 0400 - 05
450	1,703	5	60	NFPA - 0450 - 05
500	1,892	5	60	NFPA - 0500 - 05
750	2,839	5	80	NFPA - 0750 - 05
1,000	3,785	5	90	NFPA - 1000 - 05
1,250	4,731	5	110	NFPA - 1250 - 05
1,500	5,677	5	145	NFPA - 1500 - 05
2,000	7,570	5	145	NFPA - 2000 - 05
2,500	9,462	5	170	NFPA - 2500 - 05
3,000	11,355	5	200	NFPA - 3000 - 05
3,500	13,247	5	245	NFPA - 3500 - 05
4,000	15,140	5	260	NFPA - 4000 - 05
4,500	17,032	5	310	NFPA - 4500 - 05
5,000	18,925	5	390	NFPA - 5000 - 05

Electrode unit weight may vary, sizing based on maximum practical weight, shorter electrode life can be accommodated to suit project specific requirements.

CPCL shall provide a formal quotation for a standard NFPA 20 CUPRION® within 2 working days from receipt of a formal enquiry, email cpc@cathodic.co.uk. For further visit our website at www.cathodic.co.uk.



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CUPRION® Anti Fouling - Offshore Platforms

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CUPRION®

MARINE ANTI-FOULING SYSTEM

OFFSHORE PLATFORMS

Biofouling of water intake pumps and pipework on offshore platforms can be a major problem, causing expensive equipment damage and pipework blockages, leading to shut down of vital seawater supplies.

In the case of fire water systems crew safety and structure integrity must be considered. In addition, repairs to damaged pumps and pipe work are both costly and time consuming.

Maintenance Managers would consider any remedial actions involving pipe section removal, repair, cleaning and re-installation as major refurbishment work on any operating offshore facility.

CUPRION® - THE SOLUTION

Cathodic Protection Co. Limited (CPCL) has developed a range of CUPRION® anti-fouling systems to protect submerged pumps, seawater intakes and associated pipework against marine growth. Originally the CUPRION® system was developed and utilised for North Sea applications during the early 1970's. Today the system is specified for use on offshore platforms worldwide by many of the major oil & gas offshore operators.

The CUPRION® system is listed on Article 95 of the EU Biocides Regulation (528/2012) which came into effect on 1st September 2015, ensuring CPCL is legally entitled to place the CUPRION® system on to the European market.

CUPRION® operates on electrolytic principles, employing a small d.c. current flow (generally less than 1 kW). This current flow energises copper and aluminium anodes to produce a fully effective, anti-foulant dosing solution. Selected dosing levels vary slightly to suit location and application, however maximum dosing limits utilised for design purposes are 24 µg/litre and 4 µg/litre for copper and aluminium respectively.

Copper is a natural biocide and provides complete protection from hard marine growth with no adverse environmental impact.

Aluminium anodes produce aluminium hydroxide, which combines with the copper ions holding them in solution, keeping pipe work blockage free. Aluminium hydroxide also helps arrest corrosion on internal pipe surfaces.

The CUPRION® system has been successfully applied on all types of seawater intakes from submerged pumps to open intake sea chests. The design of the electrode units can be adapted to suit all application requirements, but are usually mounted on submerged pumps or bolted to the wall of a sea chest.

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MARINE ANTI-FOULING SYSTEM

OFFSHORE PLATFORMS

Where space or weight restrictions are design considerations, CPCL has developed a deck mounted system that utilises an electrolysis tank with required seawater supply connections.

The CUPRION® anodes are simply mounted in the tank and energised to produce anti-foulant solution, which is delivered to the intake area via suitably rated pipes or hoses.

The reaction chamber is generally mounted on a steel plinth adjacent to the d.c. power unit, making the complete system integral, ideal for maintenance operations. Anti-Fouling electrodes take around 30 minutes to replace.

CUPRION® - IN THE OFFSHORE INDUSTRY

CUPRION® systems have been installed on all types of offshore structures worldwide, indicative list below.

Field / Platform	Country	Client	System Description
Valhall West Flank	Norway	Eureka Pump	CUPRION® system for sea water lift pump
Umm Lulu & NASR	UAE	Various	CUPRION® system installed with removable inlet strainer
ANOA & AGX	Indonesia	Premier Oil	CUPRION® Deck system for sea water lift pumps
Ravenspurn	UK	Perenco	CUPRION® system for sea water lift pump
Forties A/B/C/D/E	UK	Apache	CUPRION® fitted to sea water lift and fire water pumps
Rough Field	UK	Centrica	CUPRION® fitted to cooling water, sea water lift and fire water pumps to replace EC system

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CUPRION® Anti Fouling - Industrial Systems

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MARINE ANTI-FOULING SYSTEM

INDUSTRIAL SYSTEMS

Bio-Fouling of seawater intakes on Ships & Marine Vessels can be a major problem, causing expensive equipment damage and pipework blockages, leading to shut down of vital seawater supplies.

In the case of Cooling Water Systems, plant Integrity must be of primary concern. In addition, repairs to damaged pumps and pipe work are both costly and time consuming.

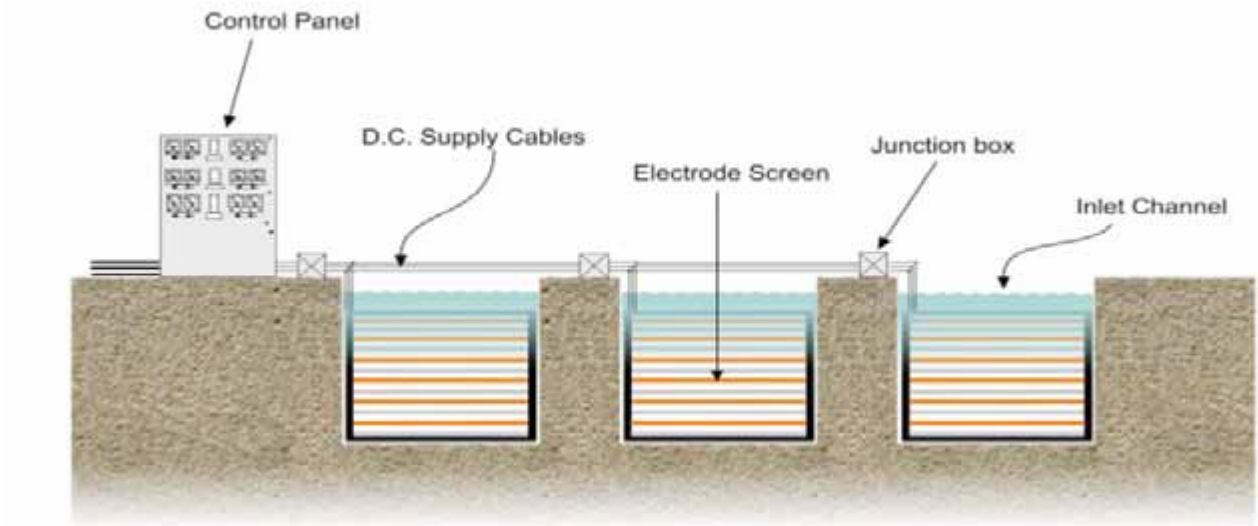
Maintenance Managers would consider any remedial actions involving pipe section removal, repair, cleaning and re-installation as major refurbishment work on any operating facility.

CUPRION® - THE SOLUTION

Cathodic Protection Co. Limited has developed a range of CUPRION® anti-fouling systems to protect submerged pumps, seawater intakes and associated pipework against marine growth. Originally the CUPRION® system was developed and utilised for application on platforms in the North Sea during the early 1970's.

The CUPRION® system is listed on Article 95 of the EU Biocides Regulation (528/2012) which came into effect on 1st September 2015, ensuring CPCL is legally entitled to place the CUPRION® system on to the European market.

Developing the system for use on industrial seawater intakes involved changes to hardware and installation methods, design requirements remained unchanged as CUPRION® operates on proven electrolytic principles.



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Aluminium anodes produce aluminium hydroxide, which combines with the copper ions holding them in solution, keeping pipe work blockage free. Aluminium hydroxide also helps to arrest corrosion on internal pipe surfaces.

The CUPRION® system has been successfully applied on all types of seawater intakes from individual submerged pumps to large seawater intake basins. The design of the electrode units can be adapted to suit all application requirements.

CUPRION® systems have been installed on all types of industrial seawater intakes worldwide, indicative list below.

Project	Country	Client	Description
Amurang 2 x 30 MW Steam Power Plant	Indonesia	PT PLN (Perso)	3 x 7,200 m^3/hr cooling water intakes
PLTU 2 Sulawesi Utara 2 x 25 MW Project	Indonesia	PT PLN (Perso)	4 x 3,000 m^3/hr cooling water intakes
Calbuco Fuel Terminal	Chile	COPEC	4 x 630 m^3/hr fire water pumps
Ras Shokir	Egypt	GUPCO	2 x 1,550 m^3/hr cooling water intakes

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