



• Biocide Free Self-Polishing Coating

QUATERRAS



NIPPON PAINT MARINE

- Point 1 Biocide Free
- Point 2 Fuel Saving 10%
- Point 3 Easy Application

AQUATERRAS - Product Outline

AQUATERRAS is a biocide free self-polishing coating based on patented hydrolysis coating technology.

AQUATERRAS differs from any other SPC antifouling paint in that no biocides have been incorporated in Aquaterras' s formulation.

AQUATERRAS' s reduction of frictional resistance and the efficiency of its prevention of fouling on ships has been made possible by the combination of its unique hydrophilic & hydrophobic micro domain structures as well as the development of a special hydrolysis (SPC) reaction.

Through Nippon Paint' s research and the development of its stable polishing mechanism, Aquaterras provides both excellent long-term fouling protection and fuel-saving.

Features	Benefits
Biocide-free	<ul style="list-style-type: none"> Reduction of marine environmental burden Smooth film Health & safety
New hydrolysis coating technology (Patented pending)	<ul style="list-style-type: none"> Excellent fouling protection Long-term stable polishing Flat & smooth and ultra low friction Approx. 10%+ fuel-saving effect
Good workability	<ul style="list-style-type: none"> Easy application (No special application apparatus)

Line-up

Suitable ship	Product
Ocean-going ship (High speed)	AQUATERRAS 1000
Ocean-going ship (Mid to low speed)	AQUATERRAS 2000
Coastal ship	AQUATERRAS 6000
New Building during outfitting	AQUATERRAS 8000

Certification

AQUATERRAS series complies with IMO-AFS2001.

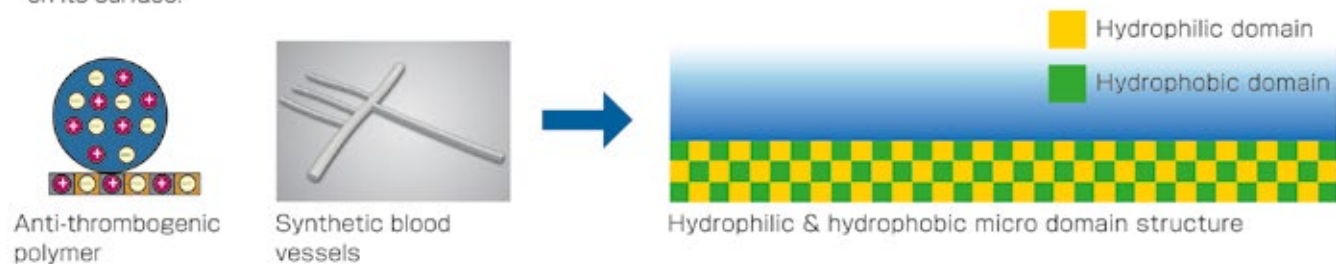
Certification from Classification Societies is available.

This product is a biocide free self-polishing coating with no chemically active ingredients.

AQUATERRAS - Micro-domain Hydrolysis Polymer Structures

Aquaterras is based on totally new hydrolysis coating technology

- Nippon Paint have long researched into which materials should be used to provide reliable fouling protection without the use of any biocidal substances or repellents.
- To solve this problem, Nippon Paint made extensive testing into many hundreds of kinds of materials. Finally, we found and modified a totally new chemistry that had been used successfully in medical antithrombotic polymers used for synthetic blood vessels.
- It is generally well understood that antithrombotic polymers prevent blood clotting due to the formation of a micro domain structure on its surface.



- Nippon Paint's chemists then developed a way to create a new hydrolysis coating technology which forms hydrophilic and hydrophobic micro domain structure on the surface to prevent biofouling.
- The surface of this new coating can be effectively refreshed by the development of a constant hydrolysis reaction and in this way AQUATERRAS will provide long-term fouling protection.



AQUATERRAS - Low friction mechanism

Low friction effect

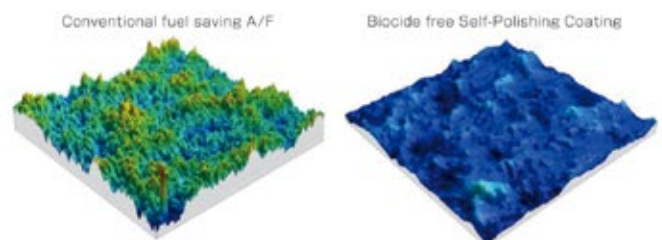
AQUATERRAS reduces frictional resistance by approximately 15% of (Frictional resistance of flat plate) generated at the interface between hull structure and sea water compared to regular SPC antifoulings.

(1) Super low roughness

Compared with standard SPC antifouling paint, AQUATERRAS (AQT) forms an ultra-flat & smooth film. AQUATERRAS contains no heavy pigment particle matters such as cuprous oxide. This significantly decreases expected hull roughness.

(2) Hydrolysis reaction

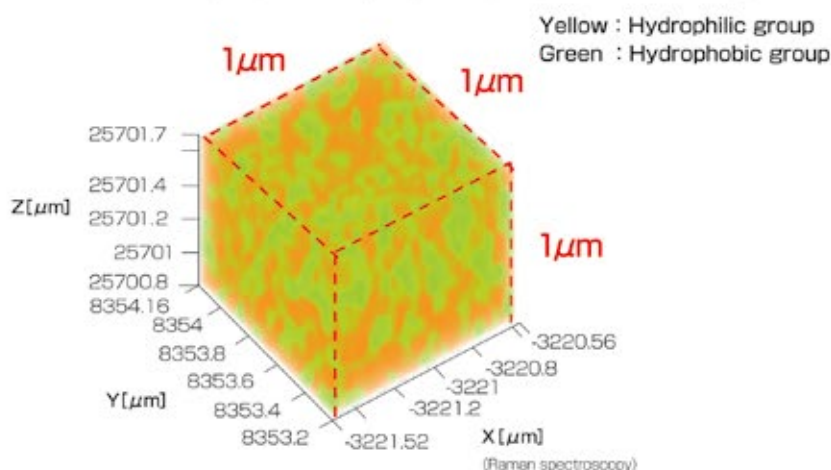
The smooth surface of the AQT coating is sustainably refreshed and maintained by a constant hydrolysis reaction.



AQUATERRAS - Verification

Hydrophilic & hydrophobic micro domain structure

Using specialised Raman spectroscopy, we can detect a concentrated distribution of both hydrophilic and hydrophobic groups in the new coating film.



Biocide free performance

Long term fouling protection performance confirmed.

Hull condition after 12 month service



Ferry 14.8 knots

Hull condition after 12 month service



Ferry 14.8 knots

Full condition after 24 month service



Cargo ship 12 knots
Japan coastal

AQUATERRAS - Fouling protection

(1) INCE PONT



(2) Fukae Maru



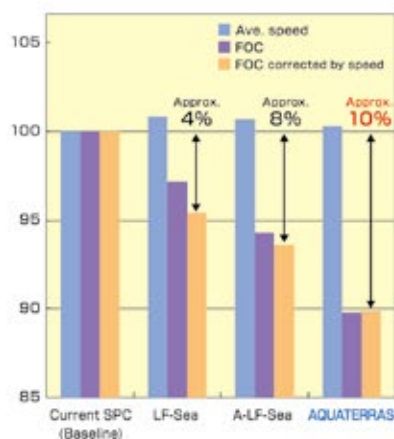
(3) Yuge Maru



Low friction effect

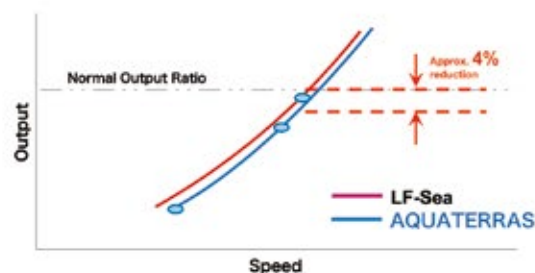
(1) Fixed point test - Kobe University FUKAE MARU

- Aquaterras demonstrates its performance on a ship over one year on a fixed route test



(2) Sea trial - Newbuilding at Imabari Shipbuilding

- Aquaterras demonstrates a 4% reduction in shaft power v speed on a new building ship compared with a sister vessel applied with LF-Sea



The name “Aquaterras” was chosen for this unique biocide free self-polishing coating system.

The origin of AQUATERRAS came from the following roots ; “AQUA” meaning water.

Our planet is a planet of water
“TERRAS” comes from the Japanese expression ‘terasu’ which means to “illuminate” or to “shine”

The development of Aquaterras was driven by Nippon Paint Holdings’ Corporate policies and philosophies for Environmental Protection and Sustainability.



AQUATERRAS® is a registered trademark of Nippon Paint Marine

Background

Nippon Paint has a long history of detailed research and development into antifouling paints that have reduced shipping's marine environmental impact and in reducing air pollution.

In 1990, Nippon Paint developed the world's first TBT-free true self-polishing copolymer (SPC) antifouling **"ECOLOFLEX"** series. Ecoloflex products have since been applied to many thousands of ships and continue to reduce shipping's costs and environmental impact today.

2008, Nippon Paint introduced **'LF-Sea'** the world's first low friction fuel-saving antifouling paint using patented hydrogel "water trapping" technology incorporated in an SPC antifouling.

2013, this technology was further enhanced by Nippon Paint's development and launched of an ultra-efficient fuel-saving antifouling paint **"A-LF-Sea"** – the advanced version of LF-Sea.

These products have been proven by experience on thousands of vessels to have contributed to the lowering of air pollution and greenhouse gas emissions from the efficiency of their low-friction surfaces the reduction of the ship's fuel consumption.

After years of further research by teams of technicians, Nippon Paint is now able to announce a significant leading step in technical innovation with the launch of the world's first biocide free self-polishing coating that is completely free of biocides.

AQUATERRAS will further contribute to shipping's reduction of both its marine and atmospheric environmental impacts.

Timeline of Technological Innovations

