Catalogue NO. NPMC-018-E5

ECOLOFLEX

The World's First TBT-Free Hydrolyzing Self-Polishing Antifouling

NIPPON PAINT MARINE

ECOLOFLEX SPC

The world's first TBT-free hydrolyzing self-polishing antifouling, containing a special acrylate copolymer developed with our patented technology as the basic resin and cuprous oxide as the main biocide, has been applied to over 25,000 ships (as of July 2024). We are constantly challenging ourselves to further improve the product performance.

	ECOLOFLEX SPC Series				
Type	**ECOLOFLEX SPC 600 HyB**	**ECOLOFLEX SPC 200**	**ECOLOFLEX SPC 200 LF**	**ECOLOFLEX SPC 150 HyB**	**ECOLOFLEX SPC 250 HyB**
Technology	Self-polishing & self-smoothing antifouling with unique copper silyl acrylate copolymer				
Activity	For Coastal Vessel (Low – High Speed & Activity)	For Ocean-Going Vessel (Cost-Efficacy Type)	For Ocean-Going Vessel (Cost-Efficacy Low-Friction Type)	For Ocean-Going Vessel (Mid – High Speed & Activity)	For Ocean-Going Vessel (Mid – Low Speed / Activity)
VSR	54% / 59% * (Low VOC type)	62%	62%	60%	54% / 59% (Low VOC type)
Fuel Saving vs. Market Average	N/A	N/A	Up to 1.5%	Up to 4.3%	Up to 4.3%
Service Life	36 months	60 months	60 months	90 months	90 months
Idling	21 days	28 days	28 days	28 days	28 days
Long term antifouling efficacy with linear and stable polishing property	✪	✪	✪	✪	✪
Easy application & overcoating	✪	✪	✪	✪	✪

**Performance claims subject to vessel size, operating profile and correct application*

EXCELLENT ANTIFOULING PERFORMANCE

Through the reconstruction of resin synthesis and structure, coupled with improved formulation technology, the process of polishing occurs evenly and continuously, and the leaching of biocide gradually proceeds in a controlled manner. Consequently, excellent antifouling performance can be expected.

LONG-TERM SHIP OPERATION

The leaching of biocide steadily and continuously proceeds as long as the paint film exists, ensuring long-term operation with the excellent antifouling performance of the existing paint film thickness.

EXCELLENT SMOOTHING AND ROUGHNESS CONTROL

The self-polishing mechanism results in excellent smoothing and roughness control, ensuring a smooth surface without the accumulation of a skeleton layer.

PROTECTS THE OCEANS FROM POLLUTION

"TBT-Free ECOLOFLEX SPC" will protect the oceans from pollution and coexist harmoniously with the Earth's environment.

Product Performance

ECOLOFLEX SPC 250 HyB
*16knots *30 months

ECOLOFLEX SPC 150 HyB
*20knots *30 months

ECOLOFLEX SPC 600 HyB
499GT *16knots *18 months

ECOLOFLEX SPC 250 HyB
*6knots *30 months

ECOLOFLEX SPC 600 HyB
*Ferry *799GT *13knots *12 months

ECOLOFLEX SPC 600 HyB
*Cargo *498GT *11.6knots *15 months

ECOLOFLEX SPC 600 HyB
*LPG *698GT *12.5knots *24 months

ECOLOFLEX SPC 600 HyB
*Chemical Tanker *498GT
*11knots *15 months

ECOLOFLEX SPC 250 HyB
VLCC | 314,014DWT
15knots | 30 months

ECOLOFLEX SPC 250 HyB
BC | 170,907DWT
14knots | 30 months

ECOLOFLEX SPC 250 HyB
PCC | 21,700DWT
20.7knots | 24 months

ECOLOFLEX SPC 250 HyB
LPG | 49,649DWT
17knots | 36 months

ECOLOFLEX 200Z
BC | 38,338 DWT | 14 knots | 23 months

ECOLOFLEX 200Z
BC | 181,279 DWT | 14 knots | 23 months

ECOLOFLEX 200K
BC | 61,632 DWT | 12 knots | 26 months

ECOLOFLEX SPC provides stable long-term antifouling performance and realises fuel cost reduction and regular service.

ANTIFOULING MECHANISM OF ECOLOFLEX SPC

The chemical reaction (Hydrolysis) occurs when the paint film contacts seawater, causing the surface layer of the paint film to gradually leach out in a controlled manner, releasing Copper Acrylate Copolymer. With the fresh active paint surface always exposed as long as the ECOLOFLEX SPC paint film exists, long-term antifouling performance and service period can be ensured.

ANTI ROUGHNESS	ANTI FOULING
• Achieves excellent smoothing and roughness control • Prevents unnecessary accumulation of paint film	• Ensures the active surface is always exposed to seawater. • Enables controlled and effective leaching of biocide • Antifouling life is directly proportional to the paint film thickness

POLISHING MECHANISM OF ECOLOFLEX SPC

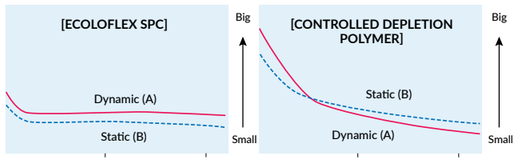
The polishing mechanism operates through the leaching of biocide via the chemical reaction (Hydrolysis) and the physical motion of seawater. This seawater motion reduces surface roughness and friction resistance, resulting in excellent smoothing and roughness control. Consequently, this contributes to reduced fuel consumption and a long-term service period. The polishing rate varies based on the ship's operating conditions, such as seawater temperature, seawater pH, speed, and trade route/history.

• Ensures long-term anti-corrosive performance • Provides high-level application control	• ECOLOFLEX SPC hydrolysis reaction and polishing mechanism. • ECOLOFLEX SPC system is suitable for various ship types and operating conditions • Long-term and stable release of biocide

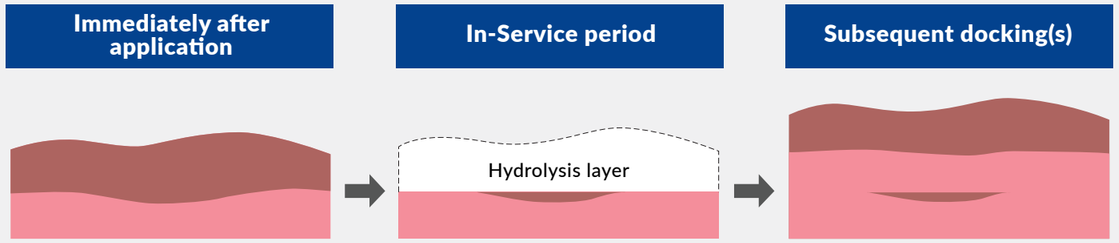
ANTIFOULING MECHANISM OF CONTROLLED DEPLETION POLYMER TYPE

This type of antifouling (A/F) paint was developed to meet tin-free requirements and comprises special water-soluble or water-swellable resins. Upon contact with seawater, these synthetic resins dissolve, swell, and bond with water. The motion of seawater against the paint film surface removes the loosely adhering dissolved, swelled, or bonded layer, releasing biocides from the paint film. However, this mechanism falls short of matching the smoothing properties and controlled biocide release of hydrolysis antifouling (A/F). Controlled depletion polymer can be categorised as "self-polishing A/F," but it is based on technology that cannot prevent the buildup of a thick leached layer (150-200µm thick) after service.

LEACHING SPEED OF ANTIFOULING IN DYNAMIC/STATIC CONDITION (See diagram)



ECOLOFLEX SPC



Self polishing mechanism results in excellent smoothing and roughness control, along with complete fouling control.

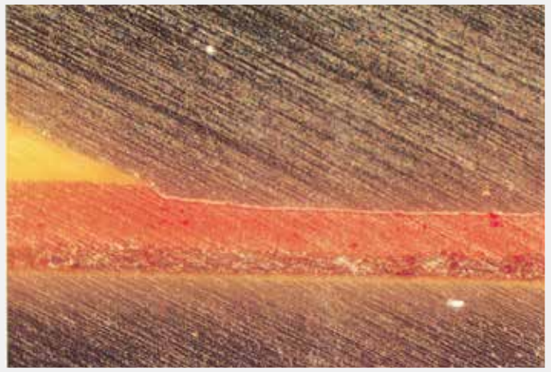
The leaching of biocide gradually proceeds in a controlled manner, resulting in reduced fuel consumption.

As the remaining paint film forms a complete surface through re-application, there is no need to carry out an overall application of antifouling coating (A/C).

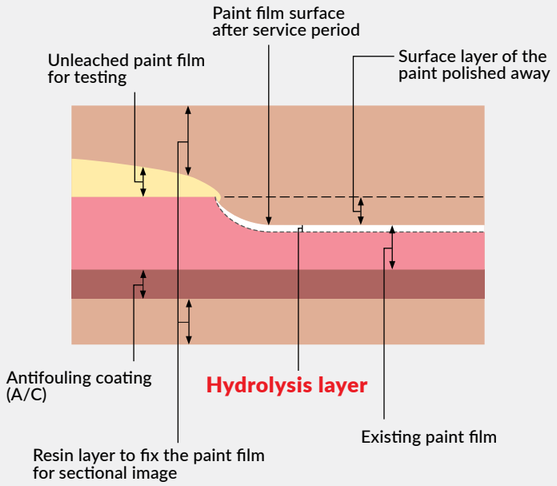
COMPARISON OF ECOLOFLEX SPC WITH CONTROLLED DEPLETION POLYMER TYPE

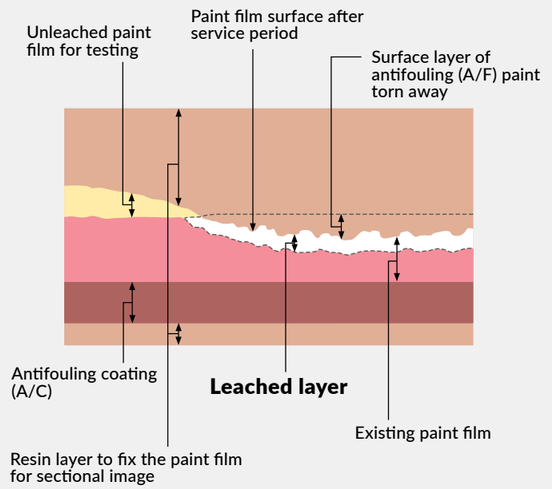
	Hydrolysis	Controlled depletion polymer
Surface Condition of Paint Film	The fresh active paint surface is always exposed, as the motion of seawater polishes away the leached layer without any skeleton layer.	The paint surface swells, and the swelled layer is physically removed from the surface by the motion of seawater. However, the actions of swelling and removal take place unevenly and discontinuously, resulting in a non-smooth paint surface.
Leaching of Biocide	As long as the paint film exists, long-term stable release of biocides is maintained.	The leached layer is physically removed, resulting in some reduction of surface roughness control. However, a thick leached layer hinders antifouling property as the biocides leach out earlier.
Term of Antifouling Performance	Antifouling life is proportional to the film thickness, and long term service period is expected.	Antifouling life is not proportional to the film thickness, and there are limits to its effectiveness.
Smoothing and Roughness Control	Surface roughness is reduced by the motion of seawater, resulting in a smooth surface.	Not smooth enough during the in-service period.
Overcoatability	As the antifouling property of the remaining paint film is sufficiently maintained, only the polished amount of ECOLOFLEX SPC needs to be applied, ensuring a certain minimum film thickness remains.	As the leached layer becomes thick and its film strength declines, detachment may occur within the swelled leached layer during repeated dockings.

HYDROLYSIS



CONTROLLED DEPLETION POLYMER

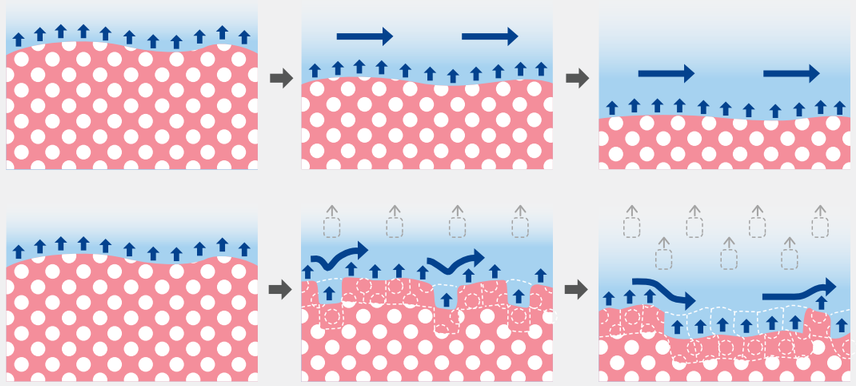




ANTIFOULING MECHANISM

ECOLOFLEX SPC/ HYDROLYSIS

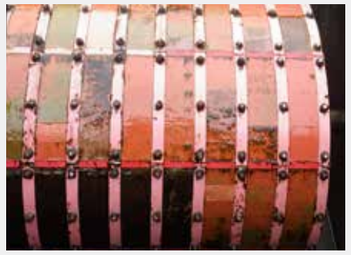
CONTROLLED DEPLETION POLYMER



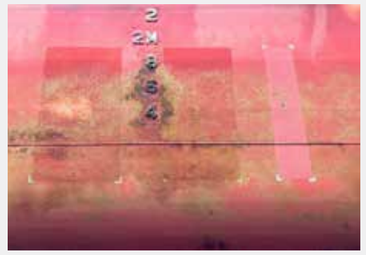
ECOLOFLEX SPC HyB SERIES

Tin Free Hydrolysis Type Antifouling Paint

ECOLOFLEX SPC HyB was developed to elevate the performance and predictability of antifouling paint to new heights. It achieves a 60-month service life by providing precise polishing rates and controlling the thickness of hydrolysis. This is accomplished by blending the ultra-reliability of Copper acrylate with Silyl resins in a unique hybrid formulation. Both new builds and vessel repairs have validated the antifouling efficiency of ECOLOFLEX HyB. The outstanding performance and reliability of this resin serve as the foundation for our distinctive LF-Sea Low-Friction fuel-saving antifouling product.



Accelerated test by drum rotor



Field test

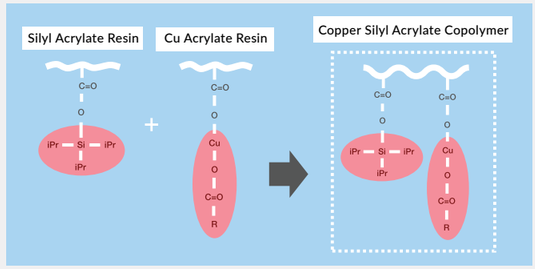
Measurement of polishing ratio

FEATURE

The ECOLOFLEX SPC HyB series features advanced patented technology involving metal-contained acrylate copolymer and silyl acrylate copolymer. This technology guarantees long-term and stable self-polishing, ensuring that the fresh active coating surface remains consistently exposed to seawater, thereby delivering excellent antifouling performance.

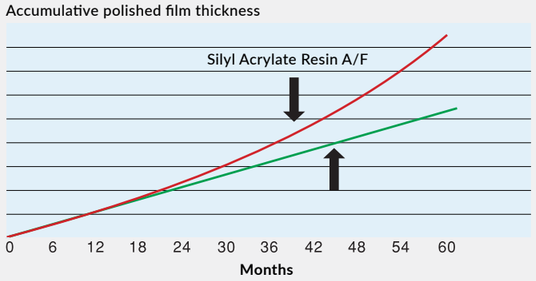
COPPER SILYL ACRYLATE COPOLYMER

Copper silyl acrylate copolymer is developed by combining it with metal-contained acrylate resin to address the weak points of the silyl acrylate resin.



POLISHING PROPERTY OF SELF-SMOOTHING A/F

This graph illustrates the anticipated polishing properties over time. In the case of silyl acrylate antifouling (A/F), its polishing tends to increase significantly after approximately 2 years. In contrast, ECOLOFLEX SPC HyB consistently maintains a linear and stable polishing property for the long term.



Nippon Paint Marine has been producing marine coatings since the 1880s and is widely regarded as a pioneer in the development hull protection and antifouling paints.

Nippon Paint Marine is certified to ISO 14001 environmental standards and manufactures coatings in line with UN Sustainable Development Goals.

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