PPG SIGMA SAILADVANCE™ NX

Ultra-premium antifouling performance. Built for the future.

We create products that deliver maximum hull protection and optimize vessel performance.

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PPG SIGMA SAILADVANCE NX is the latest addition to the successful PPG SIGMA SAILADVANCE range and represents a significant breakthrough in antifouling technology. Specifically developed to provide maximum hull protection against fouling, PPG SIGMA SAILADVANCE NX also delivers improved power efficiency and CO_2 savings, resulting in lower total operational costs and improved compliance with IMO Carbon measures.

This ultra-premium antifouling utilizes a combination of PPG's proprietary zinc methacrylate binder and Controlled Surface active Polymer (CSP) technologies to deliver optimal linear polishing that is unaffected by changing seawater temperatures. The unique formulation of the binder together with its highly effective biocide package ensures excellent protection, even when idling for an average of 45 days. The minimal leached layer achieved with this binder allows vessels to benefit from long-term hull protection and improved operating efficiency of up to 90 months.

PPG SIGMA SAILADVANCE NX is the culmination of 10 years of intensive product development by PPG's resin synthesis laboratories and has been proven in lab tests and extensive "real world" conditions on many different types of vessels.

Advanced binder technology overcomes the three major antifouling challenges

PPG SIGMA SAILADVANCE NX exploits PPG's world leading resin synthesis research, development and manufacturing capability to deliver true best in class performance. Its ultra-premium binder technology has been cleverly designed to overcome major challenges associated with existing marine antifouling technology:

Challenge 1
Non-Linear Polishing
Binders based on the most common market technologies, exhibit a non-linear polishing pattern with a slower release rate at the beginning of the operation and a faster rate at the end of the period. This non-linear polishing may lead to performance degradation, fouling, cracking and polish through.

Challenge 2
Leached Layer Build-up
Further to the common binder phenomenon of the leached layer build-up, the antifouling performance drops over time. The leached layer may develop after being stationary or after 2-3 years of operation and significantly decreases the amount of biocide availability on the hull surface. As a result, the hull surface is often left with insufficient biocidal protection at the end of the operation period or during long stationary periods.

Challenge 3
Limited biocide package
Leached layer build up in combination with limited effectiveness of the biocide package results in insufficient protection for the wide range of global fouling growth conditions and premature vessel fouling.

PPG SIGMA SAILADVANCE NX solves these challenges

Formulated using PPG's ultra-premium zinc methacrylate resin, coupled with CSP technology, PPG SIGMA SAILADVANCE NX benefits from a molecular structure that has twice as many reactive sites to promote chemical hydrolysis than other acrylate technologies. The increase in available reactive sites, allows hydrolysis to be carefully controlled and results in a minimal leached layer and true linear polishing. This ensures that the amount of biocide availability is controlled to the level required for maximum and stable protection over the operation period and while stationary.

Three Unique Levers

1. Real Linear Polishing	Maximum & predictable performance during the operational cycle
2. Minimal leached layer	Maximum biocide availability at all times and when stationary
3. Premium biocide package	Covers the full range of aggressive fouling conditions

PPG SIGMA SAILADVANCE™ NX

Impeccable linear polishing you can rely on

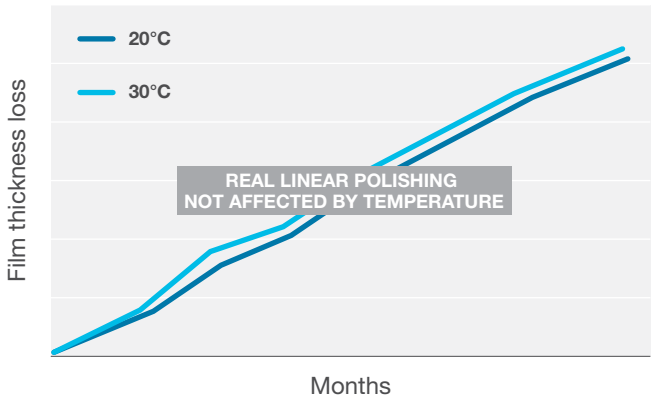
1. Real Linear Polishing

PPG SIGMA SAILADVANCE NX sets a new standard for linear polishing

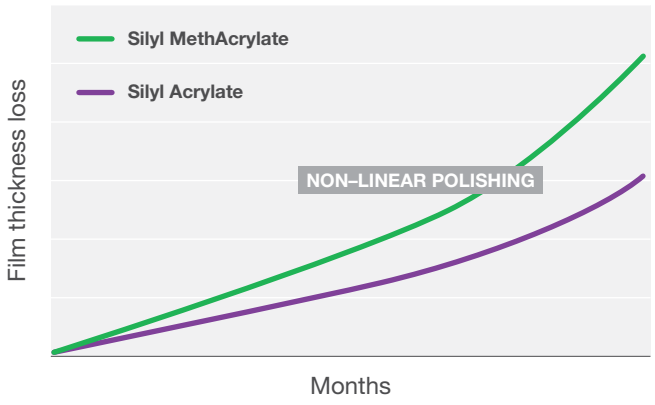
The unique combination of PPG's zinc methacrylate resin and Controlled Surface active Polymers (CSPs) results in unrivaled linear polishing that is unaffected by seawater temperature and far exceeds the non-linear polishing regularly experienced with products that are based on other, less effective acrylate technologies.

Proven performance after 3 years at 9 knots and 50% activity

SAILADVANCE NX polishing rate



Polishing rate of alternative competitor acrylate binders*



*From competitor's publicly available material.

2. Minimal Leached Layer

PPG ultra-premium binder gives predictable long-term performance and 45 days protection

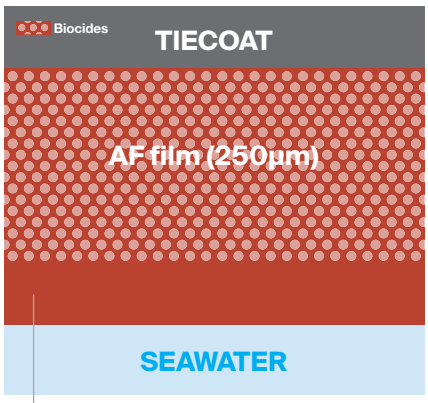
Most conventional and silyl acrylate antifouling products develop a significant leached layer build-up when a vessel is stationary and/or after 2-3 years of operation.

The development of this leached layer dramatically reduces biocide availability and quickly compromises the effectiveness of the coating.

PPG SIGMA SAILADVANCE NX utilizes a unique binder formulation that has been designed to minimize the development of a leached layer.

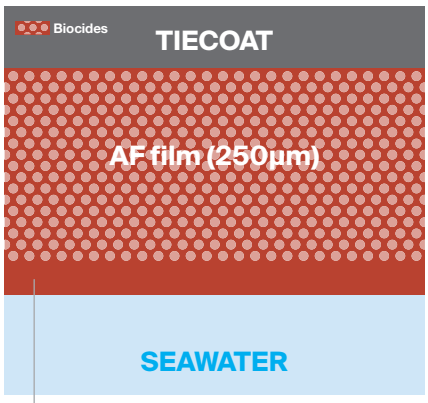
In tests, and applications with existing customers, it shows no performance loss over the tested period of operation and reliably delivers 45 days of idle time protection.

Conventional AF technology



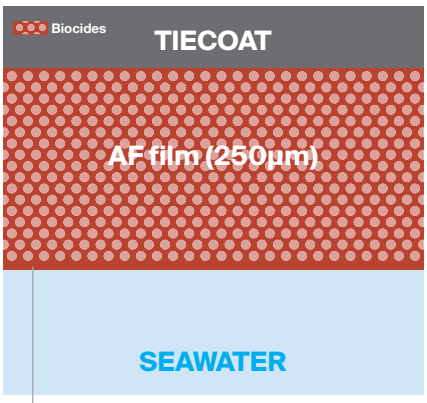
LEACHED LAYER
40-50 µm after 3 years

Silyl Acrylate technology



LEACHED LAYER
10-20 µm after 3 years

PPG SIGMA SAILADVANCE NX



LEACHED LAYER
0-5 µm after 3 years

3. Ultra-premium Biocide Package

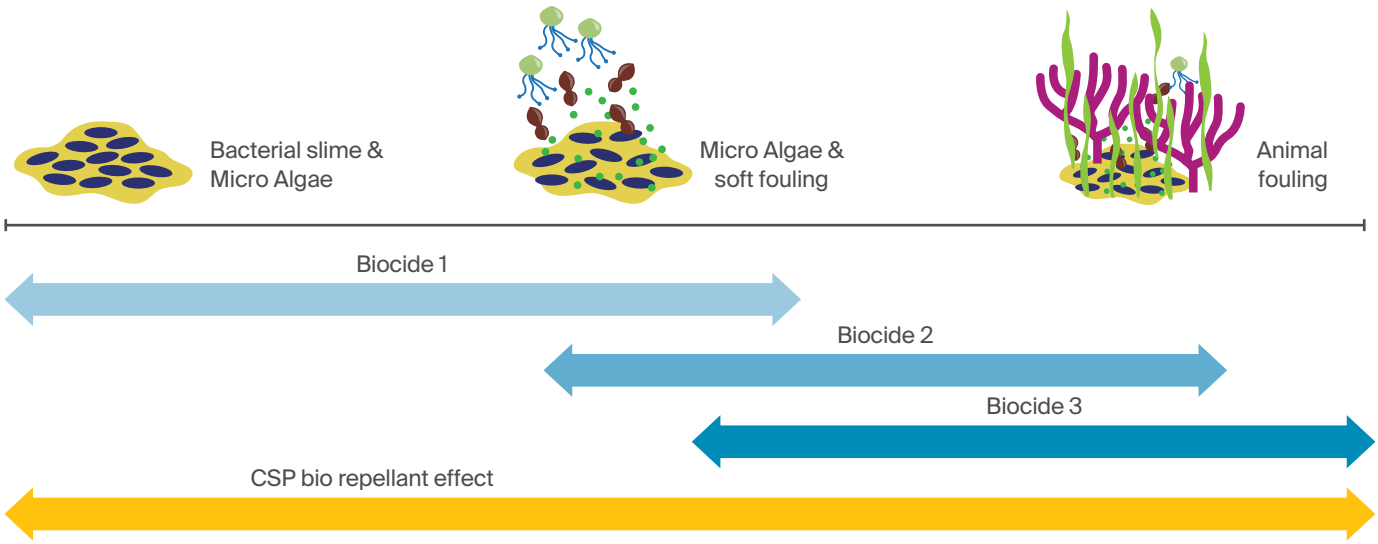
Premium biocide technology allows wider operational conditions and extended idle time

PPG SIGMA SAILADVANCE NX contains an ultra-strong biocide package targeted at different types of fouling growth; bacterial slime and micro-algae, soft fouling and animal fouling.

All biocides used are fully approved by the United States Environmental Protection Agency (EPA).

Careful formulation of the biocides has ensured that their effectiveness overlaps, so giving complete coverage and allowing wider operational conditions and uniquely long idle periods.

The outstanding performance of the ultra-strong biocide technology is further underpinned by the bio-repellant effect of PPG's Controlled Surface active Polymers (CSPs) whose slippery surface reduces the ability of fouling to adhere.

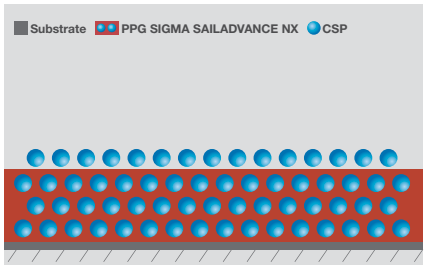


Controlled Surface active Polymers (CSP)

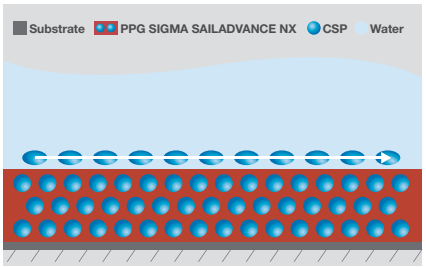
Controlled Surface active Polymers and zinc methacrylate - a powerful combination

In addition to zinc methacrylate, PPG SIGMA SAILADVANCE NX also utilizes PPG's patented Controlled Surface active Polymers (CSP) technology. By acting as a lubricant on the coating/water interface, the CSPs support laminar flow and so reduce hull friction when a vessel is active.

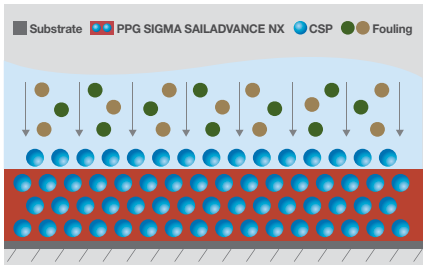
They also create a slippery surface that resists fouling when the ship is idle. The powerful combination of CSPs and zinc methacrylate extends the possible idle time protection to 45 days without affecting the hull's performance.



CSPs in antifouling submersed and static



Fully submerged and in water flow, the stretched CSPs support laminar flow at higher speeds and result in lower hydrodynamic friction



Fully submerged and static. The slippery surface will reduce the ability of fouling to adhere

PPG SIGMA SAILADVANCE™ NX

Premium biocide technology

Features	Benefits
Ultra linear polishing Constant surface activity	Predictable ultra-premium performance for the operation period
Minimal Leached Layer Constant availability of the strong biocide package	45 days static protection
Ultra-premium biocide package and the release effect of engineered oils (CSP)	Protection against the full range of fouling conditions
Ultra-low friction from lubricating Controlled Surface active Polymers (CSP)	1.0 - 1.5% speed loss, improved fuel saving capabilities and up to 15% CO_2 savings
High volume solids	Low VOC, improved sustainability and reduced waste

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