



A Short History of Antifouling

JJ Conklin
Martin & Ottaway, Inc.



History of Antifouling

- ▶ The first successful widely recognized form of antifouling was copper sheathing which started as early as the 16th century.
- ▶ In 1625 William Beale was the first to file a patent for a paint composition containing iron powder, copper and cement.
- ▶ By 1870, more than 300 antifouling patents had been registered. The basic principle of the majority of antifouling paints is to use biocides to stop the settlement of fouling organisms through a leaching mechanism.
- ▶ The most common biocides were copper based, but that changed with the introduction of Tributyltin (TBT).



TBT

- ▶ In the mid 20th century, Tributyltin (TBT) antifouling paint was the most effective product on the market because it was the strongest biocide on the market.
- ▶ TBT originally was deemed safe enough to not cause damage to the environment but by the 1980s, much evidence suggested otherwise.
- ▶ TBT was so effective because it successfully poisoned barnacles, algae, and other invertebrates. However, that success had a negative side because through biomagnification all marine predators were exposed to the toxins.
- ▶ These toxins led to hormonal issues, genetic abnormalities, birth defects, and infections.
- ▶ These toxins can remain in ecosystems for up to 30 years, and are especially problematic in coastal estuaries where TBT coated vessels slowly release TBT into the bottom sediment.



Modern Antifouling

- ▶ In the 1980s, TBT's were being banned through the IMO and the industry started to respond.
- ▶ In 1987, the first TBT Free Controlled Depletion Polymer (CDP) polishing antifouling paints are introduced globally.
- ▶ In 2002, the first self polishing antifouling system was introduced for deep sea ships.
- ▶ In 2007, Intersleek® 900 was introduced. Based on fluoropolymer technology, this paint is exceptionally smooth with very low levels of average hull roughness.



Ablative Paints

- ▶ Ablating paints are another self polishing coating that wears off slowly over time, exposing a fresh layer of biocides.
- ▶ These paints do have a very long life span compared to other antifouling products.
- ▶ However, these paints could be harmful to the environment because when a hull with this paint is scrubbed in the water biocides are released directly into the environment.



Today's State of the Art

(As Defined by International Paint)

- ▶ Intercept 8000LPP
- ▶ Intersleek 1100SR



Intercept 8000LPP

- ▶ Intercept 8000LPP is the first linear polishing antifouling that allows predictability in performance no matter where the vessel trades.
- ▶ When the polishing of the antifouling is linear, one can specify the right amount of thickness and coats for the vessels trading patterns.
- ▶ Its polishing mimics that of the old tin antifouling coatings (without the tin).
- ▶ Specifically designed for the deep sea market, Intercept 8000LPP enables ship owners to plan effectively throughout the docking cycle, for in-service periods of up to 90 months.
- ▶ However, when the ship stops trading and is static more often, the chances of seeing fouling accumulation increases.



Intercept 8000LPP

- ▶ Lubyon[®] polymer technology is ‘superhydrophilic.’ This creates a lubricating effect at the coating surface which also swells on contact with water helping to smooth out imperfections.
- ▶ With surface friction reduced, it results in less drag with subsequent reduced fuel and emissions savings of up to 5% of the annual average.
- ▶ Lubyon[®] technology reacts with seawater, releasing the optimal amount of biocide constantly over the scheme life to prevent fouling settlement.
- ▶ This release rate is largely unaffected by seawater temperature.



Intercept 8000LPP

On contact with water **Lubyon** polymer swells, smoothing out imperfections



helping vessels move through the water with reduced friction





Intersleek 1100SR

- ▶ This antifouling coating contains no biocides.
- ▶ Intersleek 1100SR is very smooth and reduces the drag of a vessel through the water. Reducing the drag of the vessel through the water can reduce fuel consumption.
- ▶ The product works by a surface effect whereas animal fouling and slime have a difficult time settling on the surface since it is very slippery.



Intersleek 1100SR

- ▶ Suitable for slow steaming offering operational flexibility
- ▶ Biocide free with high volume solids (72%) for an enhanced environmental profile
- ▶ It can be applied over existing antifouling systems without the need for full blast
- ▶ Excellent color retention maintains vessel appearance.



Intersleek 1100SR



Silicone



Early Fluoropolymer



Intersleek 1100SR

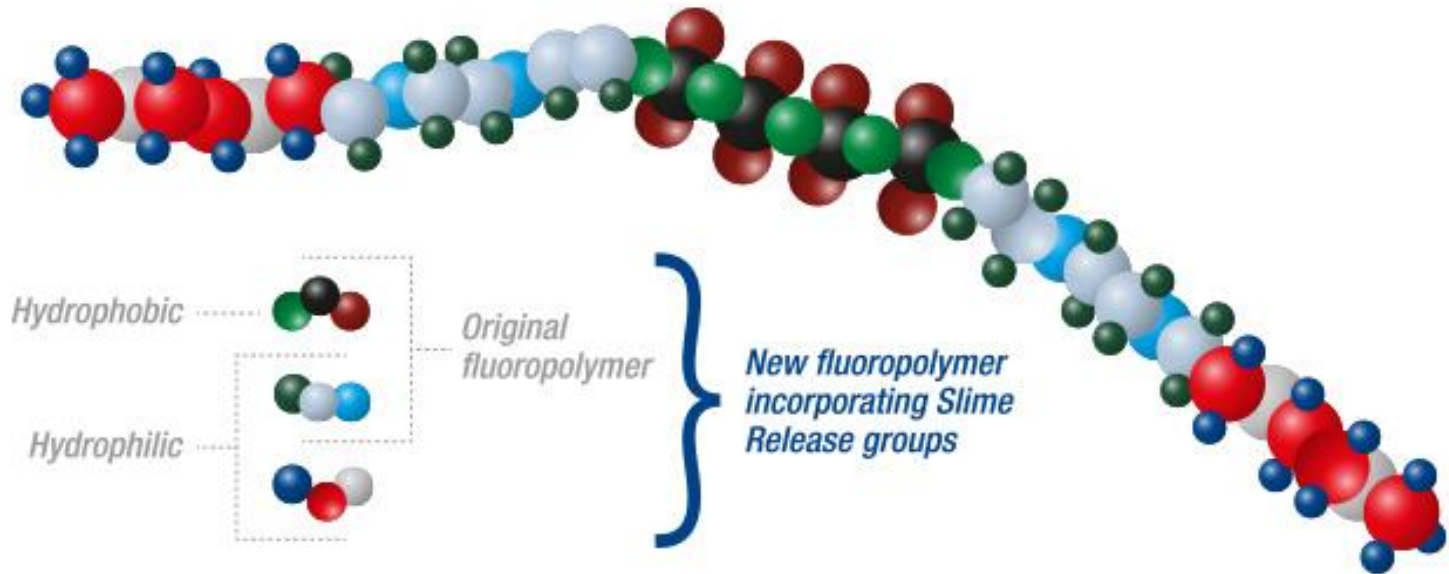


0-3 KNOTS RECORDED AT 2000 FRAMES PER SECOND 80 x REAL TIME SPEED





Slime Release Technology





Slime Release Technology

- ▶ New fluoropolymer technology with enhanced slime release properties maintains performance throughout the docking cycle.
- ▶ Studies from International Paint resulted in a new patent for controlling slime on ships' hulls and industry leading insight into slime formation, settlement, release and its impact on vessel operating efficiency.
- ▶ The tailored surface chemistry of this new fluoropolymer technology specifically influences and resists the adhesion and settlement of organisms that make up slime colonization.



Slime Release Technology

- ▶ It is necessary to create a surface that limits the capability of the extra cellular polymeric substances (EPS) to adhere and spread.
- ▶ This is achieved by modifying the surface energy of coatings to become more hydrophilic and yet maintain a hydrophobic portion.
- ▶ The surface of Intersleek® 1100SR remains amphiphilic yet has a more hydrophilic characteristic.
- ▶ Due to this new technology, only a single full coat is required every five years through a vessel's lifetime, therefore paint consumption is significantly reduced which further decreases your environmental impact.



Coating Repair

- ▶ Antifouling paints on smaller vessels do encounter a fair share of problems.
- ▶ The main problem they face is cracking or blistering.
- ▶ Over time, the water entering the hull chemically reacts with the glass fibers and uncured resins. This reaction produces pressure which causes blistering and cracking in the surface.



Coating Repair

- ▶ Once blisters and cracks start, the boat's laminate will absorb water like a sponge.
- ▶ Antifouling paint alone will not prevent this from occurring; an epoxy barrier coat must be applied to seal the hull prior to bottom paint.
- ▶ The barrier coat will protect and seal the hull.
- ▶ The antifouling paint must then be applied on top of the barrier coat to keep the seal.



Coating Repair

- ▶ Recoats are needed because antifouling paints, depending on the type, can release all their biocides or slowly wear away like a bar of soap.
- ▶ Man-made pollution and natural occurrences can affect antifouling paint performance—water temperatures, silt dirt, pollution and water flow.
- ▶ Intervals between recoats can vary depending upon product used, type of water conditions, and usage.

Cost

- ▶ The pricing for these state of the art paints runs at approximately \$6 per square foot.
- ▶ That being said the cost for a large vessel of say 80,000 square foot could be ~\$480,000



Future Improvements

- ▶ The biggest obstacle for ships when it comes to antifouling is the vessels static periods.
- ▶ The longer a ships sits static, the increased potential exists to accumulate fouling.
- ▶ The next step to improve these state of the art paints is to make a high performing antifouling that performs exceptionally well for prolonged static periods.



Sources

- ▶ <http://www.international-marine.com/antifoulings/history-of-fouling-control.aspx>
- ▶ <https://darchive.mblwhoilibrary.org/bitstream/handle/1912/191/chapter%2011.pdf?sequence=20>
- ▶ http://www.afloat.com.au/afloat-magazine/2011/october-2011/Antifouling_Paint_History_Efficiency_Marine_Impact#.VAi-w_IdWSo
- ▶ <http://www.international-marine.com/foulrelease/slime-release-coatings.aspx>
- ▶ <http://www.international-marine.com/PDS/10084-M-eng-A4.pdf>
- ▶ <http://www.international-marine.com/PDS/10086-M-eng-A4.pdf>
- ▶ [http://www.researchgate.net/publication/259654556_Elisabete_Almeida_Teresa_Diamantino_Orlando_de_Sousa_Marine_Paints_The_Particular_Case_of_Antifouling_Paints_Prog._Org._Coat._59_2-20_\(2007\)/file/d912f51080622b4bef.pdf](http://www.researchgate.net/publication/259654556_Elisabete_Almeida_Teresa_Diamantino_Orlando_de_Sousa_Marine_Paints_The_Particular_Case_of_Antifouling_Paints_Prog._Org._Coat._59_2-20_(2007)/file/d912f51080622b4bef.pdf)
- ▶ http://www.yachtpaint.com/LiteratureCentre/antifouling_101_usa_eng.pdf
- ▶ <http://www.ppg.com/en/newsroom/news/Pages/20131216B.aspx>
- ▶ <http://starboardmarinerepair.com/new/?q=bottom-painting>



Where does a Hull policy belong?

