Proving the Benefits of Foul Release Coatings

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International’s Fouling Control Range

International Paint have been at the forefront of fouling control for a number of years

• International have the widest selection of fouling control technologies available which empowers the ship operator to make the choice of product which is right for their requirements

• Our Intersleek®, foul release products are one of many different technologies available which are
  – Biocide-free
  – High solids
  – Low in volatile organic compounds (VOC) content

• Foul release coatings operate through a pure physical means and influence the settlement and adhesive strength of fouling organisms
Developments in Foul Release

Foul release coatings have been commercially available for over 18 years

- Based on polydimethyl siloxane chemistry ("Silicones"), the first commercial product, Intersleek®425 was launched in 1996 for fast craft >25 knots
- Over the years, the technology has been tailored to suit wider vessel applications and market concerns
  - Intersleek®700 launched in 1999 as the first silicone system for the liner trade
  - Intersleek®900, the first fluoropolymer, launched in 2007 for the wider market of bulkers & tankers as well as to tackle the growing concern of slime.
  - Intersleek®1100SR launched in 2013 specifically targeting slime formation

Intersleek®700 on VLCC after 60 months
Intersleek®900 (red) on postpanamax containership after 60 months compared to Intersleek®700 (grey)
Intersleek®1100SR (left) on LNG carrier after 25 months compared to Intersleek®700 (top) and Intersleek®900 (right)
Propeller Coatings

Intersleek® foul release technology has been used to coat propellers for a number of years

- Ship operator reports indicated potential to reduce noise, vibration and fuel consumption

- Study by Mutton et al however failed to confirm any of these findings

- Main positive effect of coating propellers with foul release coatings is that they are protected from fouling
  – Annually, around 50 propellers are coated
Fuel Savings

One of the most discussed attribute of foul release coatings is their ability to generate fuel savings

• The main aspect to consider about fuel savings is how they are measured and where they come from;
  – **Technology provider** may give simulated or actual data to show fuel savings
  – **Customer** of the technology provider may provide testimonial evidence of fuel savings
  – Assessment of data by **independent specialists** may show evidence of fuel savings

• All of these methods to show fuel savings still leaves uncertainty in the minds of the customer

• Only way to demonstrate fuel savings is an **independent** and **transparent** standardised methodology for the collection of data from vessels

• International with Intersleek® have been very vocal about the fuel saving potential
Fuel Savings – How it Started

The most common source of fuel saving is from customer testimony

• For foul release coatings, the first customer testimony comes from Buquebus Espania S.A.

  “The most important result to mention is that the benefit of using Intersleek has been immediate. For instance, in our catamarans we have found an increase in their speed of 1 to 1½ knots, and in the single hulls it has been of 1½ to 2 knots.”

• Similar results were also observed in the speed trials for the Patricia Olivia II which was coated in Intersleek®425

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Why do Foul Release Coatings result in Fuel Savings?

Foul release coatings give the smoothest commercially applied films

- Due to their basic chemistry, foul release coatings naturally spread out when applied
- Self-leveling of foul release coatings can even mask the roughness of earlier fouling control systems
- Surface roughness increases of 20-25 microns, in the form of Rt50 is attributed to increase power requirement for vessels by 1%\(^1\)
- Having smooth films at the start of a docking cycle gives the vessel the best opportunity for efficient operations

Hydrodynamic studies in the late 1990’s and early 2000’s showed film smoothness for foul release coatings influenced frictional resistance.

- Intersleek® foul release showed to significantly reduce frictional resistance compared to antifoulings.
- Evidence that both surface roughness and compliance of the coating contributed to the reduced friction.

\[ \text{Frictional Resistance Coefficients Reynolds Stress Method} \]

\[ \text{Newcastle Cavitation Tunnel} \]

\[ \text{Reynolds Number} \]

\[ \text{Intersleek 700 Cf (Stress)} \]

\[ \text{Intersmooth 460 SPC Cf (Stress)} \]

\[ \text{Steel Cf (Stress)} \]

\[ \text{Power (Intersleek 700 Cf (Hama))} \]

\[ \text{Power (Intersleek 700 Cf (Stress))} \]

\[ \text{Power (Intersmooth 460 SPC Cf (Stress))} \]

\[ \text{1M. Candries, Drag, Boundary-Layer and Roughness Characteristics of Marine Surfaces Coated with Antifoulings, Thesis, December 2001} \]
Why do Foul Release Coatings result in Fuel Savings?

EU-funded project AMBIO hydrodynamic studies in the 2009 showed that foul release technologies also influenced skin friction

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Can These Customers all be Wrong?

Inco Ships get free ride with Intersleek®

Sydney based Inco Ships Pty Ltd were the very first.

Wightlink get faster!

With a total fleet of eleven ferries and three catamarans, Wightlink Ltd operates on average 68,000 sailings a year. Carrying 5.5 million passengers annually, Wightlink’s key focus on the Fastcat routes is vessel speed and efficiency.

Committed to operational excellence, the company, which began over 180 years ago, wanted to use the best fuel release coating technology available for their three fast ferries. After comparing various in-service performance results on their vessels they selected Intersleek®.

April, 2004 took the dry-docking of the vessels “Faster Cat”. Our Lady Ferries and Faster Shalians respectively. These vessels all typically operate at a speed of 9-0-9 knots. The vertical shafts of these vessels were coated with Intersleek®, offering exceptional cost benefits, including improved fuel consumption and reduced emissions.

In conjunction with major engine overhaul on the Fastcat Ferries and catamarans, Wightlink have kept a close watch on the effect of Intersleek® and have identified a significant speed increase after application. The Fastcat now runs at a reduced engine rpm, complementing associated fuel savings.

Intersleek® represents the latest advance in fuel release technology delivering excellent performance benefits, very low levels of hull roughness and an exceptionally smooth surface.

Mercator L reduces consumption by up to 9%

Mercator Lines Ltd. is one of India’s fastest growing shipping firms. With a diverse fleet including tankers and bulk carriers, they are pioneers of latest generation interesterification technology.

Mercator Lines Ltd are proud to be the first shipping company in the Indian subcontinent to apply Intersleek® fuel release coating. In October 2007, Intersleek® was applied at the shipyard in Kerala using the “Prem Pride”. A 106,000dwt Aframax operating at 14 knots in Dubai, showing enhanced performance in service results, Mercator Lines Ltd applied Intersleek® on the “Prem Pride” in June 2008.

Mr. Ashish Garg, General Manager of Mercator Lines Ltd commented: “We continued to closely monitor the performance of both vessels in service. In 2008, we achieved an 8% fuel savers on “Prem Pride” using Intersleek®. This year, with even more data, we can confirm that fuel and emission savings have been maintained on this vessel.

“While we continue to be happy with the performance of Intersleek® on the “Prem Pride”, we fully expect an improvement on the “Prem Pride” as we have increased the speed of the underwater hull to include the “Prem Pride”. The detailed monitoring of the performance of the “Prem Pride” has confirmed that we are now achieving up to a 9% reduction in fuel consumption under comparable conditions.

With the resulting combined fuel consumption savings the coating has reduced emissions to the environment amounting to 1,120 tonnes of CO2, 90 tonnes of NOx and 1,200 tonnes of SOx.

Mr. Pravin Raut, Chief Engineer of Queen Mary 2, explains how this was calculated “Prior to the dry-docking, in order to achieve the necessary speeds to meet our demanding schedule, we would need to utilize four of our six main engines. Since the application of the Intersleek® system to the vertical sides, the vessel has been operating with in-service performance benefits.

Mercator makes no with Intersleek®

Cunard, the famous brand operated by Carnival UK, has confirmed significant savings on its flagship liner Queen Mary 2 since converting from a silane-based TBT-free self-polishing copolymer antifouling in November 2008 to International Paint’s fluoropolymer fuel release coating Intersleek®900.

Cunard has not only seen a significant increase in fuel efficiency, but also a reduction in abrasion to the propeller. The vessel’s fuel efficiency has improved by over 10%.

Mr. Tony Horne, Chief Engineer of Queen Mary 2, explains how this was calculated “Prior to the dry-docking, in order to achieve the necessary speeds to meet our demanding schedule, we would need to use all our four main engines with one engine running at reduced power. Since the application of the Intersleek® coating to the vertical sides, the vessel has been demonstrating reduced emissions, with CO2 being emitted into the atmosphere.

National Shipping Company of Saudi Arabia (NSCSA) Reduces CO2 Emissions by over 20,000 MT with Intersleek® Foul Release Coating

Middle East Ship Management (owned by The National Shipping Company of Saudi Arabia “NSCSA”) manages a fleet of over 30 vessels including 17 Very Large Crude Carriers (VLCCs) owned by NSCSA. The Company is committed to maximizing vessel efficiency and reducing Greenhouse Gas (GHG) emissions.

During 2009 and 2010, Middle East Ship Management converted eight VLCCs from self-polishing copolymer (SPC) based antifouling to solid fluoropolymer, solid self-polishing fuel release technology.

The vertical sides of the VLCCs were cleaned and coated with Intersleek® and following application, detailed performance monitoring was carried out.

The analysis covered the entire cooling period, prior to the application of the Intersleek® system (36 months) and the performance to date since application (18 months).

The results show an overall 6.5% improvement in fuel efficiency compared to the previous SPC coating. This can be directly attributed to the service performance of Intersleek®. The data has been independently verified by vessel performance specialists EMCO.

This 6.4% efficiency improvement means a saving of over 8,500 MT of fuel or more than US $32 million at $500/tonne. Transitioning the emissions savings, the reduction in fuel consumption has prevented over 20,000 MT of CO2 being emitted into the atmosphere.

Interested in finding out how your company could benefit from using Intersleek®900?
Taking the Independent Step

International Paint believe that independence in determining fuel savings is the most important factor for credibility

- In 2010, James Corbett from the Energy & Environmental Research Associates published his paper concluding that foul release coatings could achieve savings on average of up to 10%\(^1\)

- In 2012 International Paint partnered with BMT in recognition that their automated vessel monitoring and analytical package offered the ship owner independent proof of the performance of our products

- We are the technology leaders in understanding how marine biology and hydrodynamics influence vessel efficiency through continuing to work with and fund leading academic institutes around the world

- We participate in the ISO working group for the development of the standard for determining hull and propeller performance

Taking the Validation Step

In 2014, International Paint announced the first voluntary carbon credit initiative for shipping

- Based on fuel and emission savings calculated from the vessels’ own data, the generation of carbon credits give complete independent proof of fuel savings
  - Publically available and peer-reviewed methodology detailing how to calculate emission savings
  - Third party independent auditing of the emission savings
  - Third party independent validation of the emission savings by The Gold Standard

- For every 3 carbon credits issued, there is independent validation of 1 tonne of fuel saved
  - The first claim has been submitted for almost 130,000 carbon credits for two ship operators
    - Equivalent to just over 41,000 tonnes of fuel saved
In Conclusion

Fuel saving claims from technology providers can be real and unexaggerated

• Technologies do exist which can save fuel in the marine industry
  – Foul release coatings are one of many options available
  – Significant quantities of scientific and real in-service data exists to support this

• However, in order to reduce skepticism and doubt, the process of calculating the saving must be
  – Robust
  – Reproducible
  – Transparent
  – Independent

• With our carbon credit generating methodology, we feel that we have demonstrated those key attributes
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Thank you for your attention