Hull Coatings
FACTSHEET

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Vessel Technology Advice & Support

VTAS

for Fuel Efficient Shipping

This is one of a series of Energy Saving Technologies (EST) factsheets that provide a brief description of emerging technologies which are available to ship owners and other stakeholders who are aiming to reduce fuel consumption and/or Greenhouse Gas (GHG) emissions.

HISTORY

Mariners have long been aware of the negative effects that barnacle and marine growth have on ship performance. Historically vessels have been coated with fish oil, natural resin, burnt lime, and bitumen amongst other experimental concoctions to preserve the hull surface, prevent fouling and reduce hull resistance.

The ancient Greeks used lead plating to protect their wooden vessels. Due to the high density of lead, in the 18^{th} century copper sheet was used on vessels to prevent the growth of barnacles and weeds. Unfortunately both solutions created galvanic corrosion issues for ships constructed with iron bolts and rivets. Bolting and plating materials and techniques were adapted, but as steel hulls emerged in 19^{th} century so did effective antifouling coatings.

Tributyltin (TBT) quickly became the most popular antifouling agent in the latter half of the 20^{th} century after the discovery in the 1950s of its excellent slow release properties, preventing microorganisms from attaching to the hull. Unfortunately it wasn't just hull growth being killed off; the heavy compounds were absorbed into the sediments of docks and shipping channels and harming local ecosystems. TBT was subsequently banned in the 1980s and other active elements of antifouling paint have also been placed under scrutiny as a result. The International Convention on the Control of Harmful Antifouling Systems in Ships was adopted by the IMO in October 2001 to regulate further environmental damage.

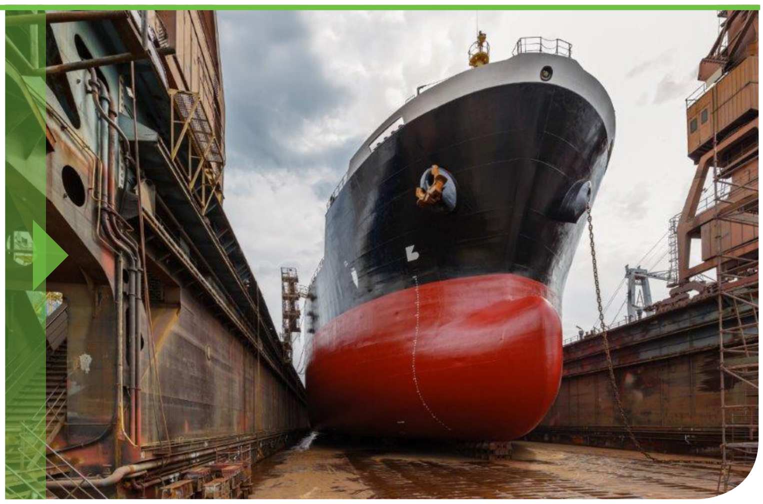
Copper compounds in antifoul are now also being phased out in many applications, as some places believe it to have a significant environmental risk. There is not a worldwide consensus, but combined with the high cost of copper the majority of fleets are driving paint companies towards finding alternatives.

Concerns with invasive species and emissions is further focusing the industry to find effective coatings that match or exceed the performance of proscribed antifouling compounds.

HOW DO THEY WORK?

Marine biofouling affects the hydrodynamic efficiency of a ship, creating drag and causing significant impairment to the ship's speed and fuel consumption characteristics. Corrosion and irregular surfaces from poor application compound the issue.

The various layers of a paint system all play their part in improving hull performance. The primary layers of application create good surface adhesion, protecting the hull from corrosion, with top coats providing the smooth surface and guarding against fouling.



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HOW DO THEY WORK?

Most coating systems use biocides to control fouling. The top coatings can be categorised into two general types:

1. Soft types, also commonly called eroding, sloughing or ablative antifouling systems, shed their top layer containing the antifoul whilst moving through the water. A subset of these soft coatings are self – polishing systems. These are applied on some larger trading vessels and create a smoother surface over time between reapplications.
2. Hard types of paint coating are usually what is referred to as 'contact leaching antifoul'. This is where the top coating creates a film containing the biocides that, when in contact with water, release the biocide at a calculated rate.

Some hard coatings contain no biocides, with additives focussed on creating a smooth non-stick film. Other hard types of paint rely on very smooth, hard non-stick surfaces like Teflon, or incorporate fibres, to prevent the marine growth gaining purchase.

SELECTING THIS TECHNOLOGY

Selecting the most effective antifoul coating is key to achieving optimum fuel efficiency. However, weighing up costs, application and environmental concerns, selecting a system suitable for the scheduled docking pattern against the large variety of systems available is a complex decision.

KEY INTEGRATION FACTORS

- Time between dockings (i.e. hard paint is more durable for long periods at sea, with reduced frequency of reapplication).
- Time available in dockings (i.e. some coatings may take significantly more time to apply with surface preparation & curing times).
- Climate & location of dry dockings (i.e. some systems require different temperature ranges & humidity for curing).
- Shipping routes, as some waters are notorious for heavy fouling.
- Operations & schedules where the vessel is stationary may encourage more growth (especially in some locations) & soft coatings rely on movement in water.
- Ship speed will determine if a soft coating can release the right amount of biocides (too high & erosion will be too quick, too slow & the sloughing will not release sufficient biocide).
- Choice of paint may compliment other EST, such as Microbubbles.
- Water type & quality will influence choice. Most systems have been formulated & approved to react with sea water. Silt & sand may be abrasive to some coatings.
- The industry is still recovering from the negative effects of TBT & only recently are paint companies claiming they can deliver effective alternatives.

TYPICAL APPLICATIONS

- All Vessels.

BENEFITS SUMMARY

- Fuel savings & greenhouse gas emission reductions.
- Easy to incorporate coating changes into existing maintenance schedules & budgets.
- Increased vessel speeds.
- Prevents transit of harmful non-indigenous species attached to the hull surface.
- Reduces corrosion & degradation of hull thickness from fouling & associated removal activity.

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HOW WE CAN HELP?

Selecting the right EST for the trades a vessel will undertake is critical to the investment decision. iTEM, at the heart of the VTAS independent assessment process, will consider the technical features of the vessels, the voyage profile all in combination with candidate EST. This is integrated with the risk and financial evaluation using your parameters or those investors are likely to recognise. Collectively this provides an informed view of how selecting appropriate EST contributes to reducing fuel consumption, lowering your operating costs and reducing your greenhouse gas emissions.

To embed this core offering VTAS is able to support you with independent consulting, analysis, feasibility and design integration advice, vessel performance and whole life cost evaluation.

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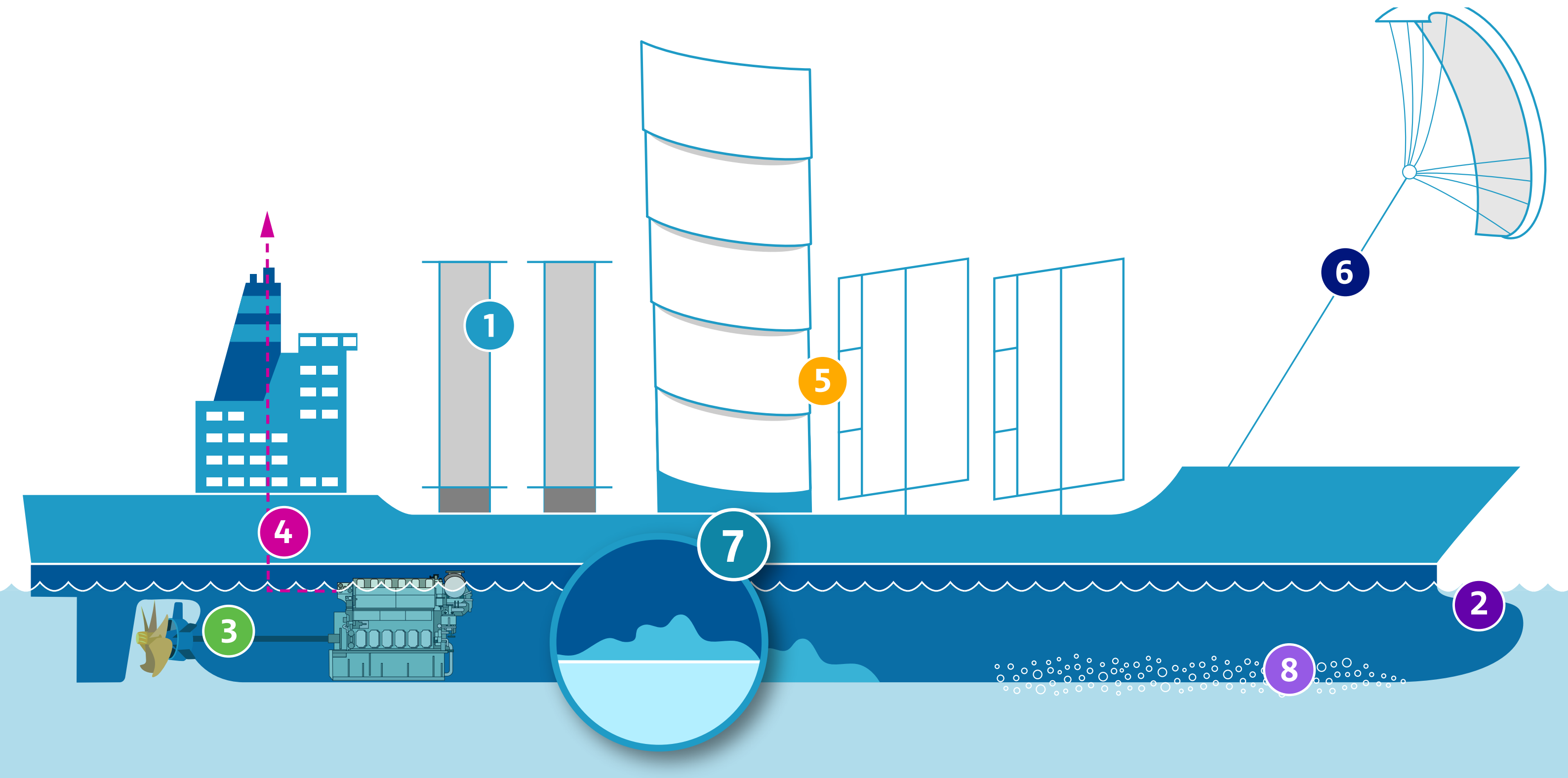
Further information can be found by visiting
www.VTAS-fes.com

or contacting us via
info@VTAS-fes.com



1. Flettner Rotors
2. Hull Form Optimisation
3. Propulsion Efficiency
4. Waste Heat Recovery
5. High Efficiency Sails
6. Kites
7. Low Friction Hull Coatings
8. Microbubbles