Anti-fouling – the challenges and the check lists

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We all want a clean and smooth bottom on our boats and effective antifouling has been the way we try to achieve this, but the challenge is to do so without negative environmental impact.

The paint or what?

Anti-fouling a yacht for effective protection is extraordinarily difficult. Large or commercial ships spend most of their time at sea and sailing at 10-15 kts, a speed at which the larvae, seeds or spores ('propagules') of fouling organisms find it difficult to attach. As commercial ships want to spend as much of their time travelling as possible, they are easiest to anti-foul. Military ships travel at high speeds but spend much of their time in harbour where the fouling takes place. Finally, the poor old yacht, in most cases, spends 95 per cent of her time stationary and when she does move it is not at a speed that will prevent attachment nor remove the lightly attached propagules. Further, a greater proportion of the hull is near the surface, and hence the light, which promotes fouling.

Current anti-fouling technologies are based on the release of biocides or on low-adhesion coatings. Biocides such as copper oxide can have long-term ecological effects. Where less strong chemicals such as cuprous thiocyanate are used (e.g. for aluminium boats), additional biocides like Zinc Pyrithione or organic algaecides are often part of the paint formula. In addition, the binding materials in paint are basically plastic particles which also leach into the sea.

Some low-adhesion coatings do not have long-term durability, some have high material costs and some require frequent maintenance.

Anti-fouling coatings for yachts are usually classified as "hard" and "soft". Ablative, or soft, paints shed small layers as the boat moves through the water, releasing more biocide. On the other hand, hard paints provide a steady release of biocide that seeps out of the paint.

In addition to the copper metal itself, organic boosters pose a significant risk to the marine environment. As a result, there is a rise in demand for more environmentally acceptable fouling prevention systems.

This has led many cruisers to high concentration two-part epoxy resin and 99% pure copper product, which can provide a surface layer of over 80% copper. Unlike hard and soft paint, the resin coating does not leach biocide, and is not meant to be shed into the water over time. Such products are aimed at hard growth crustaceans by deterring attachment rather than using chemicals to kill them. There have been good and bad experiences with such product, often associated with its application which can be technically demanding – the OCC's Behan Gifford has an article here describing her experience and this salutary experience has also been reported here.

There are, however, still more alternatives in development albeit as yet none stand out as providing the much sought-after silver bullet that prevents fouling while not damaging the environment.

A European Union sponsored project (LEAF) has looked at developing new anti-fouling technology focusing on barnacle attachment, and primarily aimed at commercial shipping, that is not based on biocide release or low adhesion. The anti-fouling effect occurs when barnacles establish themselves and start to penetrate the paint. Biocide is only needed in low concentrations, and the coating in which it is held can last for years.

Ultrasonic anti-fouling systems were first used in the 1950/60s in Japan, Russia and the UK. The Marconi company fitted these systems to high-speed reefers plying the Australia route but any further research and development ended with the discovery and commercialisation of highly effective tri-butyl tin anti-fouling. Ultrasonic systems are on offer today for yachts and are reported to work in the sense that they alter the strength of attachment of fouling organisms to a hull, mostly. In practice, it appears that they do not prevent all fouling but allow organisms that were normally firmly attached (i.e. requiring pressure washing to remove) to be removed by a wipe down. Typically, ultrasonic systems work in conjunction with anti-fouling paint and extend the active life of the paint and the duration of its effectiveness, reducing the speed of biocide leaching into the sea and the frequency with which paint needs to be reapplied.

Film-based products are also in development and available. One consists of very fine and closely packed fibres which are intended to prevent organisms getting in between. It is claimed that although fouling can occur eventually on top of the fibres it is easily cleaned off by brushing. Users have reported no noticeable impact on boat speed.

There are also silicone-based coatings that do not contain biocides that are fouling release film. It is claimed, that these films have fouling-repelling properties preventing your hull from colonisation by marine organisms without using biocides. However, they are most effective when a vessel is travelling at high speed.

The application of film-based products for complex hulls and rudder forms, such as centreboards and folding rudders, can be a major challenge. Also, ensuring the film is not displaced or damaged when lifting out and lowering boats into the water requires exceptional care.

In future articles, we will be looking in greater detail at some of these alternatives to traditional anti-fouling paints. If anyone would like to share their knowledge or experience then please let us know at environment@oceancruisingclub.org or post on the OCC Forum under Corrosion and Antifouling.

What to do when using antifouling paints?

Some of it is simple and straightforward, and well-known to experienced cruisers, but in other instances it depends on the facilities in boatyards. The check list then:

- collecting wash down residues and wet sanding run off is important but requires boat yards to provide appropriate facilities;
- portable bunding (collection trays) can be used but still require effective disposal facilities;
- industrial vacuum cleaners linked to a sander can be effective;
- scrapings and paint drips can be captured using a suitable sheet under the boat;
- brushes, rollers, paint trays, and protective clothing are hazardous waste and again need to be disposed of carefully;
- waste paint should similarly go to an appropriate disposal location.

The future

Much will depend on the development of the alternative technologies and any trickle down to yachts from the commercial shipping industry that reflects the different operating conditions. In the meantime, taking care with collection and disposal of waste is vital, but it may also mean that scrubbing your bottom may again become a collective, regular hobby of sailors.