

COPPERCOAT[®]

Environmental awareness
and the future of antifoul



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Global environmental regulations are tightening. The emphasis on eliminating VOCs and significantly reducing biocide leach rates and end-of-life pollution makes the future for traditional anti-fouls look bleak indeed.

Such inevitable, long overdue changes leave Coppercoat as the most viable, low leach rate, efficacious and environmentally responsible bio-active anti-foul available.



Photo above:
Coral bleaching caused in part by sea temperature increase and oceanic acidification.

With the health of the World's oceans, seas and lakes in rapid decline it's no surprise that regulatory bodies around the world are looking at ways of reducing pollution from vessels of all types. This includes pollution from primers and topcoats as well as biocidal pollution from anti-fouls.

As you would expect some antifouling products pose more of an environmental risk than others.

In 1989, in an attempt to address concerns over the poor performance of contemporary anti-fouls and the environmental problems associated with the previously popular tin-based products, paint chemists were tasked to create a more environmentally responsible and long-lasting anti-foul, with the active ingredient being the naturally occurring element, copper. The aim was for this to mimic the effect of the copper sheeting used by the British Navy from the 1700s. Naturally the paint system needed to comply with all current legislation.

At that time, new research had been published identifying at least two massive holes in the planet's ozone layer. These holes, it was thought were in some part caused by the release of both CFC's (Chlorofluorocarbons) and VOC's (Volatile Organic Compounds). Such a grave situation was always likely to lead to restrictions or bans on the use of solvents in paint systems. With this in mind it was decided that any new long-life anti-foul system should comply with any imaginable future legislation and be both water-based and VOC-free. In 1991, after 2 years of development work, the product now known as **Coppercoat** was made available to the public. It was and remains the World's only water-based and VOC-free anti-foul.

Today, **Coppercoat** is well proven to deter bio-fouling and typically remains effective for over 10 years per treatment. In doing so it helps vessels travel faster, use less fuel, and reduces their time ashore. It has clearly surpassed the design brief set 30 years ago.

Montreal Protocol (1987) set up globally to reduce the use of CFC's and other ozone damaging chemicals.

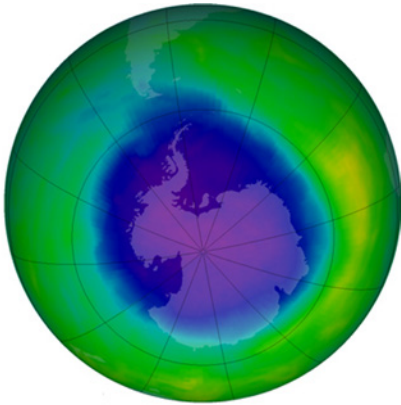


Photo above:
The hole in the The Ozone layer over the Antarctic in 1989, photo by NASA.

Now the threat of global warming (climate change) and plastic pollution are the two most serious environmental issues facing our planet. With this in mind, global regulatory authorities have started to remove VOCs from the paint systems used in buildings and the automotive industry. However, many industrial paints, including most marine coatings, still use a significant percentage of solvents. For example, traditional anti-foul paints typically contain 30-45% VOCs, and these damaging solvents readily evaporate into the atmosphere as soon as the product is applied.

Very few traditional anti-fouls use water-based technology, and even those that do tend to use it in conjunction with VOCs, typically around 15% in composition. In contrast, **Coppercoat** is both water-based and VOC-free and has been so since its development over 25 years ago.

It is not only anti-fouls that are being investigated by global regulatory bodies, but also the priming systems that are applied beforehand. These primers are often high in VOCs, commonly in the range of 30-70% in composition. **Coppercoat** requires no primer when applied to GRP, wood and concrete surfaces. While on steel and aluminium, **Coppercoat** is applied directly to whatever anti-corrosive epoxy protective scheme the metal substrate already requires. Therefore, no additional primers or undercoats are needed when applying **Coppercoat**.

With anti-foul being the most frequently used marine paint (typically re-applied every year), authorities are looking at ways to reduce the number and concentration of active substances (biocides) used. Within Europe, over recent years the list of active substances available to chemists developing new products has been reduced from over 50 to currently just 10 (with copper and its compounds being the preferred allowable options).

Furthermore, the number of active substances allowed in any one product formulation has also been reduced. In the past, conventional anti-foul paints would commonly contain a blend of several active substances, but the latest EU legislation is due to restrict the use of these co-biocides, so that any given product may contain just one active substance. **Coppercoat** has only ever used a single active substance, 99.7% pure copper powder, responsibly sourced in the UK from re-cycled copper wire.

PML | Plymouth Marine Laboratory

In a 5 year immersion test, completed by Plymouth Marine Laboratory, Coppercoat outperformed all other anti-fouls.

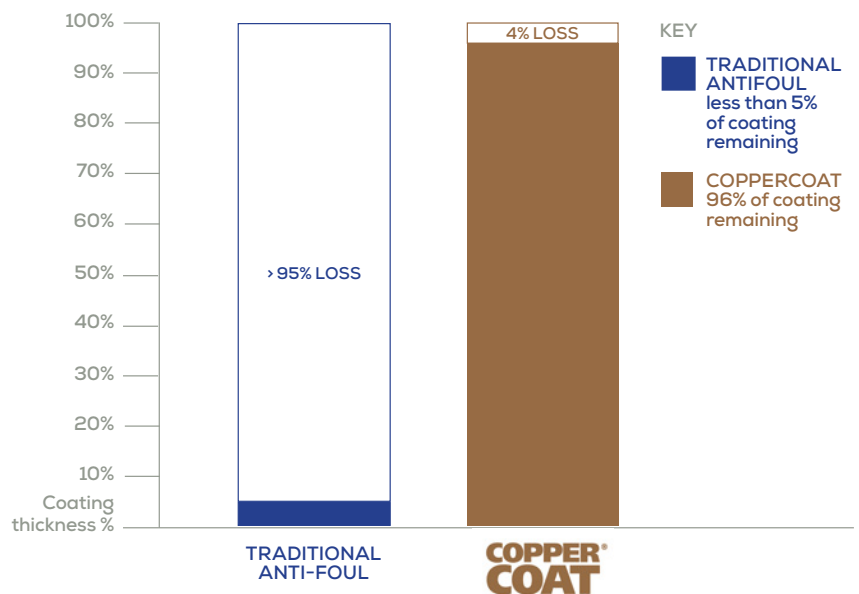
Photo right: Test rig after 5 year tidal stream trial off Orkney. Panels treated with Coppercoat (the five dark green panels) remained the cleanest and lost the least thickness.



In a recent 5-year trial conducted by Plymouth Marine Laboratory Applications Ltd (PML) on behalf of EDF Energy, a wide variety of anti-foul coatings were tested for longevity and efficacy. To quote the report published in March 2018: **“After 60 months of testing, Coppercoat was the best performing coating.”**

But of equal relevance was the environmental information gleaned during this test. On average, the test panels of traditional products lost between 90 and 100% of their antifoul and 10 to 20% of the underlying epoxy primer. In contrast, the Coppercoat treated panels lost less than 5% of their topcoat.

Table right: Loss of anti-foul thickness over 60 months: Traditional anti-foul versus Coppercoat



The trial was carried out in an abrasive tidal stream in the Orkneys and was the equivalent of a journey of 288,000 kilometres at 3.5 knots. Data from the trial also calculated the copper leach rate per cm sq. per day for **Coppercoat** at 1.4 micro grams - well under the most stringent world-wide guidelines (of the authorities in California and Sweden) which both allow a maximum leach rate maximum of 9 micro grams. If the trial had continued PML calculated that it would take 86 years and 4.9 million kilometres before 90 % of the biocide in **Coppercoat** had been lost to the ocean.

This is something that usually happens in one season with traditional antifoul. It is appearing ever more likely that wider global anti-foul legislation will follow the lead of both California and Sweden.

Over the years, with annual applications, the use of traditional anti-fouls results in a significant build-up of “spent” paint. This build-up results in thick flakes of several years’ worth of aged anti-foul detaching from the hull - both in the water during use and ashore when laid-up. Indeed, paint flakes of over 15 years in age have been identified in marina mud samples and there is now a call for this type of pollution to be classified as “micro plastic” pollution.

The anti-foul that does not wash away or detach under sail is partially removed by pressure-washing when a vessel is eventually slipped. Then typically, after between 10 and 15 years, it is completely removed by scraping or blasting. This removal process produces significant toxic waste material, much of which ends up back in the marina (as most yards are yet to install containment facilities).

This results in concentrations of biocides that are hazardous to the delicate eco-systems found in marinas and semi enclosed bays. In contrast, **Coppercoat** is harder than the gel-coat on GRP vessels and is not removed by pressure washing or in-water scrubbing. When a re-treatment is eventually required (typically after 15-20 years), this is simply applied directly over the old treatment.

Photo left:
Flaking paint caused by annual antifoul build-up.

Photo right:
Hull scrubbing causes significant toxic waste.





Photo above:
**Rough antifouling surface
damages hull performance**

So unlike with traditional anti-foul coatings, with **Coppercoat** there is no “end-of-life” contamination. With authorities around the world citing DIY anti-foul removal as a major marine pollutant, tighter regulations are inevitable. This will increase the cost of the anti-foul removal process which, combined with pressure to ban DIY anti-foul applications, makes **Coppercoat** the most cost effective and environmentally responsible alternative currently available.

Traditional anti-foul paint works by absorbing water so that it can release its chemicals and slowly wash away, deterring and removing the build-up of bio-fouling in the process. This absorbency and the fact that the “spent” anti-foul accumulates over time (with annual applications) means that traditional anti-foul has a negative impact on hull performance when compared to a clean hull without anti-foul (high performance race boats are kept out of the water and “dry sailed” with bare hulls for a faster finish). In contrast, **Coppercoat** is an incredibly hard coating using epoxy resin which is non-absorbent and repels water. Independent tests on motorboats have shown up to a 5% performance improvement at cruising revs in both semi-displacement and planing hulls. This more efficient finish allows vessels to cruise at reduced engine speeds, meaning less fuel used and lower rates of pollution.

In recent years several alternatives to biocidal anti-fouls have been developed. If any of these new generation products are going to remain on the market in the long term, they will certainly need to use water-based and VOC-free technology, have long and effective lifespans, deliver a low “in use” environmental impact and produce little or no “end of life” pollution. Neither the new silicon-based coatings nor the recently developed removable plastic films fulfil these environmental criteria.

As increasingly restrictive legislation takes effect it is likely that **Coppercoat** may soon be one of very few active anti-fouls allowed. The reduction in the type, number and volume of biocide allowed in anti-fouls is likely to lead to the withdrawal of traditional systems for the DIY user. **Coppercoat** will not be affected in this way as it has only ever used one biocide (the naturally occurring element copper) and can be proven to work at leach rates well below 9 mg cm sq. per day.

To quote from the British Coatings Federation (BCF) June 2019 Digest 117:

“This may therefore ultimately lead to the withdrawal of ALL anti-fouling paints for consumer use, if they can no longer be formulated to meet basic performance requirements due to the restrictions on the use of biocide actives.”



Photo above:
Haikou Marina under construction in Hainan Province.

Photo below:
Environmental award in recognition of helping to reduce the environmental impact of boat ownership. Coppercoat received the “Most Eco-Friendly Business Award” at the China International Boat Show, the 1st antifoul company to receive such an accolade.



This concern follows on from a BCF statement in the December 2016 Digest 107:

“It is generally thought that virtually ALL anti-foul paints will fail this assessment if they choose to do this under an inside-marina scenario.”

The billions of dollars being invested in our oceans, lakes and rivers through Boatbuilding, Aquaculture, Oil and Gas, Power production, Fishing and Tourism to name a few will only provide the expected return if anti-foul systems remain genuinely effective.

But regulatory officials from several major paint companies fear that their current biocidal anti-foul products may be banned within just a few years. This is because the current formulations cannot be made to comply with new leach rate requirements while simultaneously providing effective anti-fouling performance.

Coppercoat does not face these problems because it is already compliant, effective and very long lasting. It is the most viable, low leach rate, efficacious and environmentally responsible bio-active anti-foul available and comes as no surprise that Aquarius Marine Coatings Ltd. won the “Most Eco-Friendly Business” award at the Shanghai Boat Show for its well-established product Coppercoat.

Over the next few years we shall see yet further tightening of the environmental legislation pertaining to anti-fouls, leading to the withdrawal of even more (and quite possibly all) of the traditional style paints currently available. But with Coppercoat already being water-based, VOC-free, low-leaching and with no end-of-life concerns, those requiring an efficacious anti-fouling in both the commercial and leisure sectors can remain confident of the continued availability of a legally compliant and environmentally responsible solution.

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