



BUBBLEBOAT PROJECT

Innovative approach for antifouling paint with low environmental risk profile



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PREFACE

Since long time ago ship industry is looking for new approach and new products for antifouling paint application. The new needs of industry is to match together efficacy, stability, costs and eco-efficiency profile. The needs is driven by the ban and/or the replacement of dangerous active molecule used till today. In particular, during the IMO Conference held in London, the SPC (Self-Polishing Copolymer) paint based on TBT have definitively been banned to be used in every kind of paint, starting from the 1st January 2003. Moreover since the 1st January 2008, a new limitation was established for tin compound presents on the hulls of vessel, with the duty to remove the applied paint from ships (Regulation EC n. 782/2003). **Project Bubbleboat** started with the target to find an eco-friendly alternative to the classical antifouling paint, that were based on dangerous biocides for aquatic environment and bioaccumulative for the food chain.

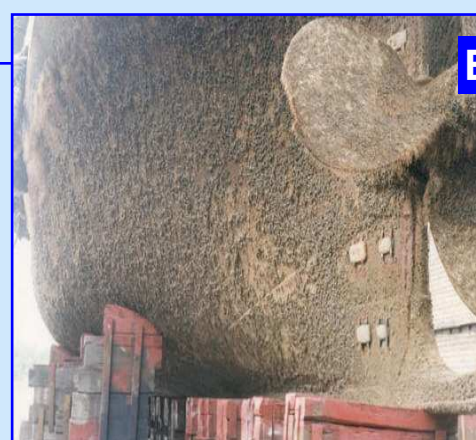
MATERIALS AND METHOD

Activity tests: stability/activity control ((Uvikon 923 UV/VIS) (CyberScan pH 2100 BenchMeter - Eutech Instruments, with ion selective membrane - Mettler Toledo) in sea water solution and with active compound immobilized on water based polymeric resin (Crilat D120S-Vinavil), applied on fiber glass sample.

Biological test on *Artemia franciscana*: (prot.n.8060 APAT-IRSA-CNR-29/2003) multiwell plated, coated with resin (control) and resins + active ingredient (Test 1).

Biological test on *Phaeodactylum tricornutum* (ISO 10253:2006): leached, Test 1 and control, t = 96 h, controlled light and temperature (Ecotox Ecotherm 80). Algae growth determined by microscopy (Leica ATC2000) by direct counting with Bürker camera.

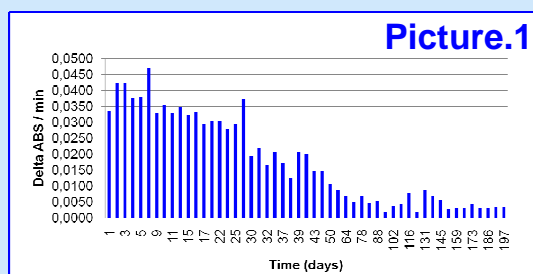
Leached was obtained by 5x5 fiberglass sample, treated on both side with resin+active ingredient, dried on air for 48 h and one cycle leached on artificial sea water (prepared by ISO 10253:2006 method) and vacuum stirred. Supernatant has been filtered (Millipore 0,45 µm) and it has been utilized to inoculate of algae population.



BIOFOULING

RESULT AND DISCUSSION

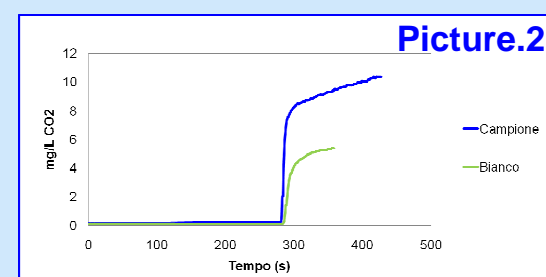
One of the partner of Archimede R&D S.r.l. for Bubbleboat project is **ENVIREN LABORATORIES** – High Technology Network of Emilia Romagna Region (IBIMET Department – CNR Bologna).



Picture.1

1 – ACTIVITY ASSAY

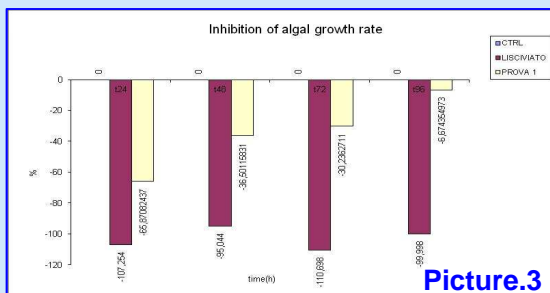
A **FORECATS OF ACTIVITY** has been performed by spectrophotometric test (graphic picture 1): data collected since today it possible to conclude that active ingredient is still active in sea water for at least **8-12 MONTH**.



Picture.2

2 – ENTRAPMENT

Resin+active (Campione) compound has been distributed on fiberglass and the activity of the new technology was tested. As shown in picture 2, **THE ENTRAPPED NEW TECHNOLOGY IS STILL ACTIVE** compare with the control test (Bianco). Test show also a surprising increased of stability, with an higher decaying time compare with the free water solution of the active ingredient.



Picture.3

3 – ALGAE GROWTH INHIBITION (*Phaeodactylum tricornutum*)

The graph (picture 3) shows inhibition percentage of algae growth. Contacts test trends of algae growth (Prova 1) clearly shows an **EVIDENT AND LONG LASTING INHIBITION EFFECT**, slowly decreasing along time. Leached (=Lisciviato) test shows an amplified inhibition response with a constant effect along the test duration (96 h). These results are the demonstration of a **DIRECT INTERFERENTIAL EFFECT OF ACTIVE COMPOUND** on algae growth.

4 – BIOLOGICAL TEST ON *Artemia franciscana* (crustacean)

Results show a very low toxicity (5%, 48 h) and **DO NOT SHOW ANY TOXICITY CONSEQUENCE** of the used active ingredient.

CONCLUSION

The developed new technology of **BUBBLEBOAT PROJECT** shows all the characteristic to be a candidate a san **ECOLOGICAL ALTERNATIVE** for antifouling paint biocides. While these biocides show an high risk profile, the results clearly demonstrate: a compatible stability of the Bubbleboat technology with the normal replacement rate of traditional paint; the active ingredient can be easily inserted in industrial formulations (polymeric coating), *in vitro* biological tests have demonstrate a relevant inhibition on algae growth together with **NON DANGEROUS EFFECTS ON ORGANISM OF THE ACTIVE INGREDIENT**.

Further test will be performed in the next month. Among them, test in different polluted environment will be evaluated.