

“Paint-it” project: eco-friendly anti-fouling marine paints.

From the LIFE PAINT-IT Project (LIFE 15 ENV/IT/000417), a novel manufacturing process based on a pre-industrial/prototype scale, capable of producing innovative high-quality safe anti-fouling (AF) paints for naval applications, is under development and implementation. The high environmental sustainability of the paints ensures a total reduction of biocides harmful for the aquatic species and continuously released from the traditional AF paints in the marine environment especially in form of copper compounds. Starting from the chemistry of organic-inorganic hybrid resins, the technology underlying the process give rise to coatings with a peculiar micro-patterned amphiphilic surface. The co-existing of hydro- and oleophobic domains at the surface in a well-suited structure allows the disorientation of the organisms involved in fouling formation by impeding their consequent establishment and growth. At the same time, thanks to the combination with silicone elasto-mechanical features, typical of the generation of foul-release (FR) coatings, they are able to boost the final anti-vegetative action and facilitate the cleaning cycle of the hull. Moreover, the additional robust polyurethane chemical base ensures a high chemical stability and resistance of the final coatings to the severe application conditions required.

The preliminary scale-up phase involved the optimization of the formulations for the final application on small and medium-sized hulls. In particular, the characterization on a laboratory scale of the anti-fouling capacity, the mechanical evaluation as well as adhesion to different substrates such as fiberglass and steel, the control of the rheological properties and aesthetic finishing mainly for spray/airless application technologies, have been completed by the coordinating partner, University of Rome Tor Vergata.

As it can be argued from the following **Figure 1** that the lab-scale results of applied formulations drive towards a wide range of customizable solutions, and hence, a high replication potential is expected.

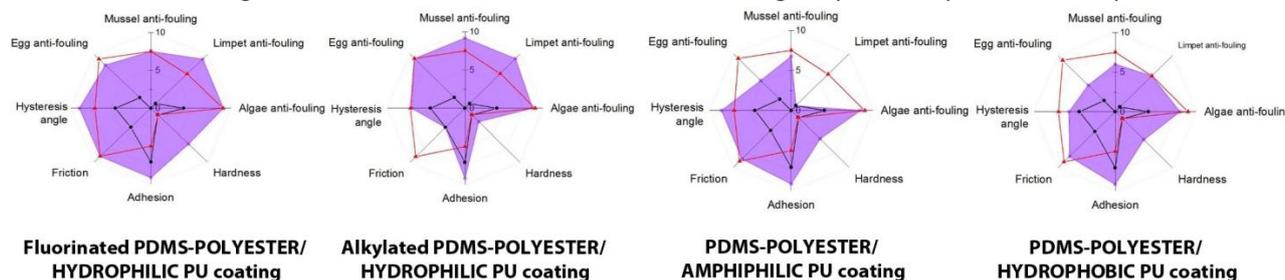


Fig. 1 Radar plot results of some selected formulations

A preliminary evaluation in close-to real conditions was performed by a practical testing on selected formulations after application on the steel flap of a volunteered fishing boat and 13 months of stay at sea are envisaged (**Fig. 2**). At a first visual examination of the hull overboard, the treated area resulted clean. In parallel, a preliminary evaluation of the ecotoxicity on the optimized paints was carried out by the partner University of Rome Niccolò Cusano, by using the *chlamydomonas reinhardtii* wild alga (**Fig. 3**).



Fig. 2 Detail of the application on a owner fishing boat

The ecotoxicity tests indicated that the cells visibly died in the case of a biocide paint coated support, while they resulted alive on the coatings (green colour comparable to the control), confirming the absence of toxic activity towards algae and micro-organisms of biological reference.

The second phase concerned the optimization for the pre-industrial production on a pilot plant. The pilot plant prototype (**Fig. 4**), under construction, will definitely operate at the partner company site (Cericol, Colorobbia Consulting - Vinci) and will provide for the continuous production of at least three selected formulations, by the end of the 2018 autumn period. The upcoming future actions will concern the final validation phase. As regards, the application by the dedicated partner company (Azimuh-Benetti - Sovigliana) on large-scale supports and a testing prototype vessel will be achieved in order to assess the AF

activity and mechanical resistance (final validation phase), both in harbor calm water and in real conditions for a standard 6-month navigation period at sea (next summer season of 2019).

Project details

- Project co-funded by the European Commission within the Life + Programme (2014-2020) LIFE-PAINT-IT ENV/IT/000417 (% EU Co-funding: 22.55%).
- BUDGET total amount: 5.712.506 EUR.

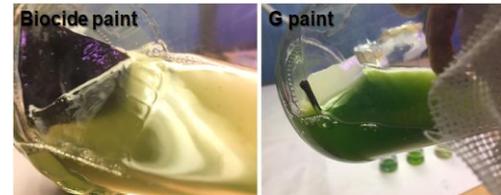


Fig. 3 Results of preliminary ecotoxicity test with *chlamydomonas reinhardtii* wild alga on a selected paint

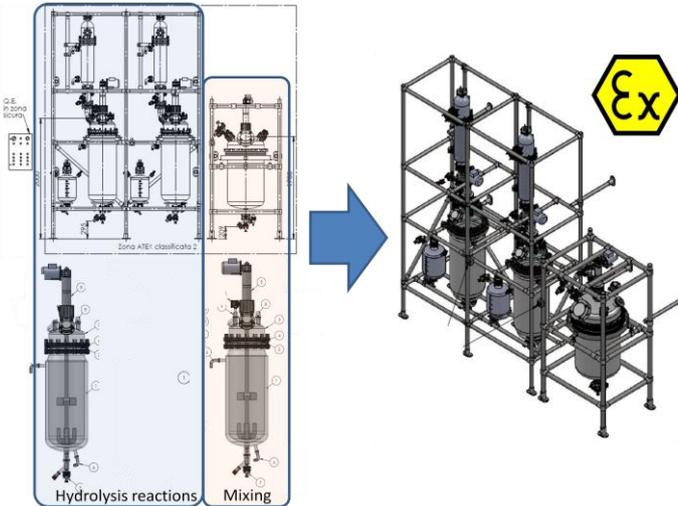


Fig.4 5 Scheme of the pilot plant prototype under construction

