

THE OPTIMAL ANTIFOULLING SHIP SYSTEMS

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Abstract: In this paper are presented aspects about optimal antifouling systems. There are know that the paints which are used in ship technologies are biocides (they are contained TBT- tri-butyl-toluen) and now we must used another ecological paints.

By 17 September 2007, 25 States representing 38.11% of the worlds merchant shipping tonnage signed the IMO AFS Convention (also known as the "TBT Convention"). This means that the Convention will enter into force one year after - 17 September 2008. According to the Convention text TBT-based paint must not be applied after 1 January 2003, and by 1 January 2008 no ships must carry active TBT-based paint on their hulls. The effect of the IMO AFS Convention entering into force 17 September 2008 is: The IMO Member States that have ratified the AFS Convention will require that the necessary documentation to prove compliance with the Convention is available on board all ships irrespective of flag entering their ports.

Keywords: paint, antifouling, biocide substances, ecological, hydrolyze, autopolishing, nanocapsule acrylate technology, TBT .

1. INTRODUCTION

The antifoulings are represented by 4-5000 microorganism which existed on marine structures. Many shipyards offer a full range of self-polishing antifouling products, suitable for all types of vessels and all operating parameters, but in compliance with the IMO Convention adopted in October 2001. **GLOBIC NCT**, high-performance antifouling that is both self-polishing and self-smoothening, based on the groundbreaking use of nanocapsule acrylate technology. **OCEANIC**, also incorporating fibre concept is a cost-effective TBT free, self-polishing antifouling with high volume solids. **OLYMPIC** is an economical, TBT free, fibre-based self-polishing antifouling. The components of antifouling paints are: liants, biocide substances, pigments, solvents and additive mixtures. The principales antifouling paints are: conventional systems, long-life systems whith TBT and ecological systems. We present an ecological antifouling paint with auto-polishing-Globic .

2. GLOBIC TECHNOLOGY

2.1. THEORETICAL CONSIDERATIONS

The mechanism of auto-polishing paint is an process by two steps (Fig.1):

In the outlet boundary of the paint, for beginning is the reaction between liant and seawater with ph 8. now increases the seawater's solubility into the liant. In the second step, this thin boundary is free into seawater because exists the friction force generated by ship movement. The new boundary paint will be continually liable

to seawater and the auto-polishing process continues. An advantage is that the surface remains smooth. The GLOBIC paints are based on synthetic resins. The reaction with seawater is an ionic process which continues with hydrolyze process.



Fig. 1: The general mechanism of auto-polishing process

2.2. NANOCAPSULE TECHNOLOGY

The primary binder copolymer used in GLOBIC NCT consists of nano-size acrylate capsules. These nanocapsules feature a core that consists of a highly reactive acrylate. This is the binder component that is primarily responsible for the self-polishing effect in the coating. This reactive core is protected by a hydrophobic acrylate polymer shell that controls the rate at which sea water penetrates to the core. Besides this, the polymer shell has outstanding capabilities in providing controlled release of powerful antifouling agents. The working mechanism is:

- The nanocapsule acrylate binder features a shell/core structure that forms a strong, coherent paint film. The core consists of a highly reactive acrylate. This is the binder component that is primarily responsible for the self-polishing effect in the coating. This reactive core is protected by a hydrophobic acrylate polymer shell that controls the rate at which sea water penetrates to the core. The nanocapsule technology of GLOBIC NCT provides a very precise control of the polishing rate through a true self-polishing mechanism. The self-polishing working mechanism is achieved by a tailor-made interaction between the core and the shell nanocapsule acrylates.

- The self-polishing and self-smoothing capabilities of GLOBIC NCT offer a low hydrodynamic drag coefficient, which results in a reduction of fuel consumption. The self-polishing mechanism of the nanocapsule binder used in GLOBIC NCT provides the best possible balance between polishing rate and the rate at which antifouling agents are leached out. This results in a thin but highly stable leached layer that ensures the constant and controlled release of antifouling agents, thus providing a reliable antifouling performance during the entire service period. GLOBIC NCT can, on average, be specified at 15% less thickness of antifouling, offering higher fouling protection. The precise self-polishing mechanism of GLOBIC NCT nanocapsule technology provides greater antifouling performance at a lower polishing rate. This makes it possible to achieve a marked reduction in the cost of fouling protection per service month, by reducing both the dry-film thickness of antifouling and in many cases also the number of coats.

- The GLOBIC NCT products for new buildings have been specially developed to take into consideration shipyards' practical requirements regarding workability and smooth production flow.

Reducing the time for blocksetting and fast drying has been in focus in the development of the GLOBIC NCT new building line. All the wide range of impact tests, fender tests and block-setting tests carried out on GLOBIC NCT confirm its ability to meet and exceed all current and expected requirements as regards mechanical strength hardness and drying time.

It is the unique combination of microfibrils, the inherent properties of the binder and its even distribution, working in unison, that gives this coating such flexibility along with the necessary hardness. The thin leached layer and the superior mechanical strength of GLOBIC NCT make it possible to undertake repeated recoating

with no need for a tie coat. GLOBIC NCT can also overcoat antifoulings based on other technologies, including the OCEANIC and OLYMPIC ranges.

In the vast majority of cases it is even possible to use GLOBIC NCT on top of antifoulings from other suppliers, with no tie coat needed. GLOBIC NCT is compatible with virtually all other antifouling technologies.

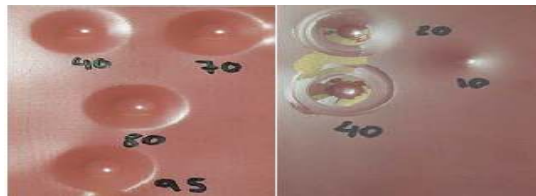
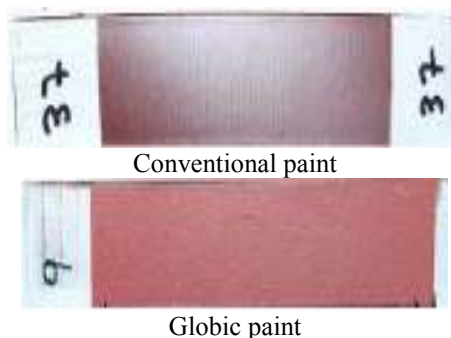


Fig.2. Globic paint

Conventional paint

Fig.3. The impact tests ($h > 95$ cm) after microfiber technology has been applied

2.4. THE STUDY OF RESISTANCE TO MOTION

This was experimented by immersed plates in special conditions to monitor the GLOBIC paints and to evaluate different factors: the dimensions of uneven surfaces. An example with a rotor immersed in water which has a sensor on the shaft and different paints which must be tested. The friction values are shown in fig. 4:

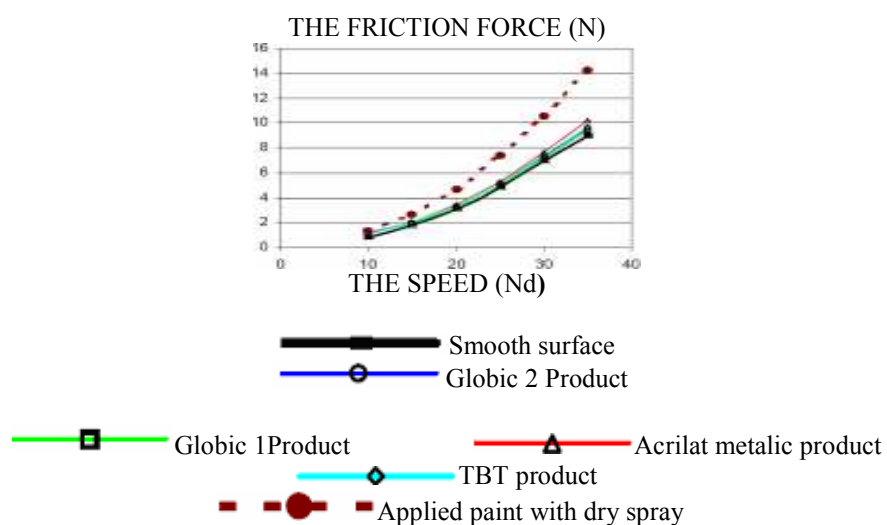


Fig. 4. The friction forces values for different products

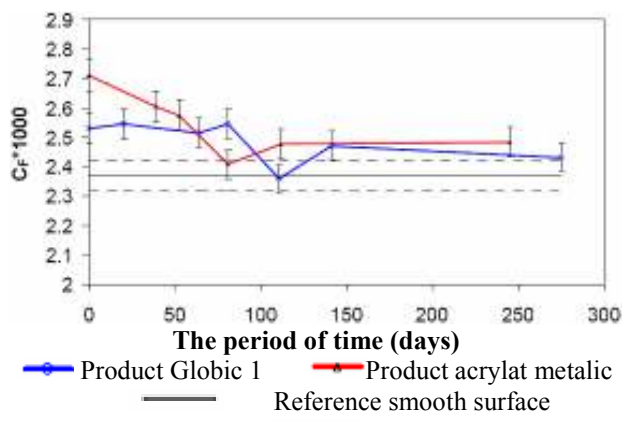


Fig. 5. The friction coefficients by 35 Nd for Globic, acrylat metalic and reference surface products

3. CONCLUSIONS

-The development of antifouling and auto-polishing processes

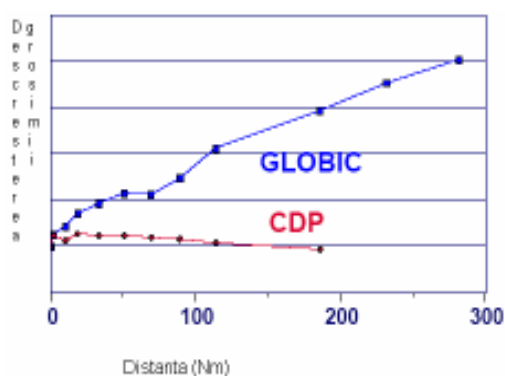


Fig. 6 The polishing speed and the exploiting period applied in Mediteranean Sea for Globic paints

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