Abstract

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Hull roughness and antifouling paint

The fouling of ships and propellers results in a reduction of speed, increased fuel consumption, and consequently, losses of both time and money. The previous studies found that a speed reduction of 0.03 knots would occur due to increased friction resulting from 10µm increase in surface roughness. This would increase fuel consumption by 1%, energy savings can then be easily converted into emission reductions. The main objective of this paper is to help shipowner/operator (to) utilizing antifouling paint to prevent fouling for economic and environmental requirements. Various types of antifouling paints have been used to prevent fouling. Traditional paints contain heavy metals, such as tin, copper, lead and arsenic, all of which release toxic biocides into the water. Tin-containing tin-base antifouling has proved its excellent technical performance since it has been introduced in 1974. In the early 1980s, when the environmental problems associated with Tributyltin (TBT), antifouling paints were starting to appear and research and development programmed on a generation of tin-free antifouling paint technology was started that focused on finding solutions to the environmental problems and under water hull performance. A fouled hull increases the environmental impact on shipping. If the world fleets were today fouled, an extra ~16.5 million tones of fuel would be burned, leading to an increase in air pollution which is represented by an extra 210 million tones of CO2. A fouled hull causes a series of risks of transporting unwanted organisms into sensitive ecosystems. A fouled hull forces a vessel to dock, thus, increasing pollution from shipyards. Fouling release is an antifouling paint which is normally silicon-based. It is a non toxic coating alternative to antifouling paints which leaves a non-stick surface. The performance of the silicone antifouling release coating improved by adding nonbonding silicone oil to the coating matrix. Fouling organisms may grow on the surface of these coatings. However, these organisms adhere poorly and can be removed by the hydrodynamic forces once the vessel attains sufficient speed. Foul release coating systems are designed with a low surface energy to reduce the ability of marine fouling to permanently adhere to the hull coating while the ship is underway. The hydrodynamic forces, produced by the moving vessel, cause marine fouling to wash off the hull once the vessel attains sufficient speed. The use of the silicone antifouling release coating on underwater hull and propellers has generally been found to be successful since they do not last long see a noticeable performance improvement after each cleaning. propeller being reported in 1993.