Case Study

National Biofilms Innovation Centre

BIOFILM RESEARCH INFORMS MARINE COATINGS DESIGN

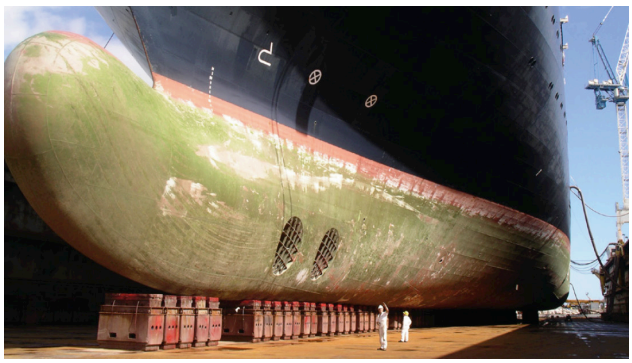
Supporting academic and industrial partnerships to tackle global biofilm problems

Biofilms, and other marine organisms such as barnacles and algae, often accumulate on underwater surfaces and result in 'biofouling'. This increases drag resistance, and thus causes greater fuel consumption and greenhouse gas emissions, and can cause the spread of invasive marine species. Preventing microbial biofouling from occurring in an environmentally sound and economical fashion is one of the key targets of NBIC and our Proof of Concept funding programme.

Current fouling control coatings, such as low adhesion paints or biocidal antifouling paints, help prevent organisms attaching themselves to ship hulls. These save the shipping industry around $60 billion per year, but researchers and ship owners are continually seeking new ways to further reduce the effects of biofouling.

Marine coatings specialists International Paint Ltd are part of the world's largest paints and coatings company, AkzoNobel. A new device to help understand the drag caused by biofilm growth on ship hulls, was developed by Dr Jennifer Longyear at International Paint Ltd and Professor Paul Stoodley at the University of Southampton, alongside Dr Stefania Fabbri at AkzoNobel, and Dr Simon Dennington at Southampton. Using a £73,000 grant via the UK Biofilms Programme funded by BBSRC and Innovate UK, the researchers built a marine biofilm flow cell to see how different surface coatings, such as antifouling paint, affect how biofilms grow and cause drag.

Alongside the flow cell, the team further advanced a small scale, high volume rheometry testing method developed in the Stoodley lab. Discs of around 40mm



Despite current antifouling measures, removal of slime and other marine organisms still incurs significant costs for the shipping industry. Image: Michael Elleray

in diameter are attached to a shaft, which is spun by a motor. When the spinning discs are submerged in a tank of water, the torque, or resistance to the motor, is measured. The discs used by the team are much smaller than the ~30cm discs, which have been more widely used in marine fouling studies. The smaller scale allows for experimental flexibility, and multiple coatings can be screened with replication within one sea exposure of a board mounted with many discs. This 'rapid screen' is a more efficient and cost-effective way for coatings companies to screen expensive or difficult-to-apply coatings, such as patterning, without having to coat a much larger disc. Professor Stoodley said,

"It's been a very successful project. I really hope it continues and I'm really interested to see what International Paint want to do with this".

Further Proof of Concept funding from NBIC, supported by BBSRC, Innovate UK and STFC's Hartree Centre, has allowed the group to continue their research and develop new materials which behave like biofilms, with which they have been able to refine the system.

Jennifer Longyear

Jennifer joined International Paint Ltd in 2010. She obtained her PhD in Engineering at University of Southampton in 2020, researching methods for quantifying marine microfouling.

Professor Paul Stoodley

Paul was Professor of Microbial Tribology within Engineering and Physical Sciences at the University of Southampton, before moving to Ohio State University to become Professor of Microbial Infection and Immunity and Director.