Harvard-NTU team finds solution to stop mussels from sticking

A slippery coating could save the maritime industry billions of dollars by keeping pesky organisms such as mussels and algae off ships.

These organisms, which increase fuel consumption by causing frictional drag and are difficult to remove, are estimated to cost the shipping industry $40 billion worldwide each year.

A joint research project by Harvard University and Nanyang Technological University (NTU) has found that a special coating can prevent the Asian green mussel – notorious for sticking onto anything and being famously difficult to remove – from attaching itself to surfaces coated with the substance. A paper on the finding was recently published in scientific journal Science.

The special coating makes use of technology developed by Harvard a few years ago called slippery liquid-infused porous surfaces (Slips), which consists of a solid surface infused with a liquid lubricant.

Slips has previously been shown to be able to keep bacteria and algae at bay.

But the recent paper is the first detailing its effectiveness against arguably the toughest of all mussels – the Asian green mussel.

Mussels are one of the worst culprits of biofouling, or the unwanted accumulation of organisms on structures such as pipes, ships and docks.

The NTU team investigated if the coating works against mussels by placing the organisms underwater on a “checkerboard” comprising different surfaces, including two commercially available coatings, two versions of Slips infused with silicone oil, and uncoated glass.

The experiment was done on three such checkerboards which had five panels of each coating. The mussels were left to choose where to attach themselves.

After 48 hours, five byssal threads, made of protein and produced by mussels when they want to attach themselves to something, were found stuck on one of the two Slips coatings across the three checkerboards. The other Slips coating had 30.

In comparison, one commercial coating had an average of 75 byssal threads per checkerboard, while the other had 30.

Associate Professor Ali Miserez from NTU’s School of Materials Science and Engineering, who led the NTU team, said the coating, which has a thin lubricant film, prevents the mussel from feeling the surface, giving it a false impression that there is nothing to attach to. Even if a mussel were to attach itself, it can be removed much more easily, he said.

His team is also studying whether a biodegradable lubricant can be used instead of silicone oil – which is not biodegradable.

Dr Guo Shifeng, a scientist at the Agency for Science, Technology and Research said: “It would be interesting to see the long-term application and performance of the coatings in actual sea water conditions.”

Samantha Boh

WATCH THE VIDEO
Mussels trying and failing to stick to a surface treated with the coating. http://str.sg/oZJ7