Robotic 'vacuum' offers shipping industry a cleaner solution

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(PhysOrg.com) -- An automated robotic cleaning system that removes marine growth from the hull of a ship is being pioneered at Newcastle University.

Designed to reduce the carbon footprint of the world's shipping industry, the robot offers a solution to spiralling fuel costs and marine related pollution while removing harmful, non-indigenous species that could be transferred to local waters.

Operating in a similar way to the automatic carpet cleaner, the robot has been developed out of an EU-funded project called HISMAR (Hull Identification System for Marine Autonomous Robotics) and is able to navigate its own way across the ship's hull.

First a map of the hull is automatically charted, recording the location of every weld, thickness change, rivet and indentation on the ship's surface.

The robot is magnetically attached to the ship's side and sent off on its journey of the hull, following a planned route and cleaning as it goes.

Adjustable jets of pressurised sea water blast the marine growth off the surface of the ship which is then sucked up into the main chamber.

Here, 150 litres of water a minute is filtered and the bio-fouling removed and rendered harmless to the local environment.

In this way, the ship’s robotic ‘vacuum’ can continuously roam the ship’s hull, preventing the build up of slime and allowing it to travel through the water efficiently by cutting down on drag.

This significantly reduces fuel consumption and also pollution such as the greenhouse gas carbon dioxide.

Newcastle University’s Professor Tony Roskilly, leading the project, said: 'Marine growth on ships is a huge environmental and financial problem for the marine industry and HISMAR offers a unique solution to both of these – and more.

'What we have created is a system that works totally independently – in or out of the water – and not only keeps the ship clean but also feeds back vital information about the hull’s condition.

'Because the map it follows is so detailed, if there is a change to its path caused by corrosion or a crack in the steel then it feeds this information back. This means it can be used as an additional check on the seaworthiness of the ship’s hull or highlight potential future problems.

'And because the drive module and navigational system are separate to the cleaning tools we hope that ultimately we will be able to fit it with different tools to carry out different tasks – such as stripping and painting the hull.'

Led by Newcastle University, the international team of experts will present a prototype of the robot at the largest marine maintenance fair in the world - Shipbuilding, Machinery and Marine Technology in Hamburg - on September 23rd.

Until the beginning of this year, ships used antifouling paints to protect them from the corrosive environment, with Tributyltin (TBT) added as a biocide to also prevent marine growth.

However, it was found to contaminate the surrounding water – having a serious detrimental impact on other marine life - and this summer it became illegal worldwide to use TBT antifouling coatings.

Newcastle University's Jonathan Heslop, a researcher on the project, explains: 'All other developed cleaning or inspection systems currently available are remotely controlled during their operation, requiring highly skilled and experienced operators to effectively clean the hull, while the ship is out of operation and usually out of the water.

'The advantage of the HISMAR robot is that it is an autonomous system so it can continue cleaning with the ship remaining in service – feeding back hull information as it does so – resulting in very little build up of slime, reduced fuel costs and much less pollution.'

The HISMAR robot uses a novel optical dead-reckoning system in conjunction with a magnetic system to identify the location of surface and sub-surface features to build up a detailed map of the ship's hull. It is this navigation system which allows the robot to operate above and below the waterline whilst the ship is in port or at anchor.

Provided by Newcastle University

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