

Maritime research with a green nod at Antwerp Maritime Academy

De Baere Kris, Jacobs Werner, Maes Raf, Arizzi Bastien, Bera Loïc, Bommelaer Pierre, Brouwers Sarah, Bureth Pierre, Clech Hugo, Corvée Gaëtan, Dedobbeleer Alexei, De Kergariou Pierre, De Meester Ralph, Doutreloux Quentin, Kesteloot Laurens, Le Felt Marine, Lindebringhs Nicolas, Minguet Ugo, Oosters Delphine, Sarr François, Storme Edouard, Van Peteghem Frédérick, Verreck Nick, Wanlin Nicolas, Wouters Michelle and Potters Geert

Antwerp Maritime Academy, Noordkasteel oost 6, 2030 Antwerp, Belgium
E-mail: geert.potters@hzs.be

At the Antwerp Maritime Academy, several lines of research are being developed which focus on the interface between the marine environment and the maritime operations that take place in that environment: corrosion, fouling, fuel use and air pollution (avoidance). Here, we offer a smorgasbord of several of the tasty offerings from this research.

Corrosion

A first line of research focuses on the different aspects of marine corrosion. Our North Sea is the last resting place of a wide range of (steel) ships, some of them dating back even to the First World War. They are doubtlessly of high historic value, but due to their role as grave monument for fallen soldiers, they also carry a high sentimental value. Additionally, most of the wrecks at the bottom of the North Sea became very important hard substrate habitats in a mainly sandy and silty environment. As such the shipwrecks appear to play a significant role from a biodiversity point of view, such as nurseries for young fish or refuges for vulnerable native species for which nowadays almost no natural habitats are available in our waters. But as these wrecks are mostly made out of steel they will disappear in time due to corrosion. In order to help prevent this, we are studying different possible protection techniques taking into account all economic and ecological parameters.

Another aspect of the corrosion theme involves ionic liquids. These are liquids that consist exclusively or almost exclusively of ions (one large organic cation and a smaller negative counterion). This unusual configuration makes them salts with melting points below 100°C (Freemantle, 2010). The goal of this project is to use ionic liquids as a green and sustainable combined solution against corrosion and fouling. Indeed, the ionic liquids may have antibacterial and anti-bio film properties useful to reduce fouling as well as an electric conductivity capable of defending steel against the corrosion. Their usefulness in marine conditions is still under study.

Air pollution

A second line of research concentrates on cargo tank operations on board of tankers. Cleaning and venting leads to areas with increased cargo vapour concentrations around and inside of the ship's structure. The aim is to provide an analysis of the dispersion of cargo vapour flows around a ship's superstructure by means of wind tunnel experiments on a model, on board measurements, and CFD method. The goal is to point out that the flow and concentration of cargo vapours depend on the tank outlet used for the operation and the direction and force of the relative wind. The eventual objective would be to make use of this study to mitigate the risk of cargo vapours being sucked into the accommodation and engine room spaces by the ventilation system. This might be achieved by proposing new spots for the ventilation intakes, and also by encouraging operators to choose wisely the tank's outlet to be used in function of the prevailing relative wind conditions.

Biofuels

Lastly, we venture in the realm of fuel consumption and its consequences. Maritime transport uses diesel, or heavy fuel oil which is even more polluting. To avoid air pollution and to safeguard the air quality for future generations, we need to focus on alternative fuels such as biodiesel. AMA is now trying to find an optimal fatty acid composition of biodiesel in order to decrease the particulate matter (PM) and NO_x content in the exhaust gases. The goal is to proffer recommendations for the production of biodiesel from algae or seaweed, starting from a known optimal fatty acid composition.