Evaluation of ship hull performance after coating retrofit

Commercial ships usually undergo dry-docking for maintenance every 5 years, at a maximum. Within this period, undesirable accumulation of marine growth on the hull – i.e. biofouling – can occur. Hull biofouling leads to increased hull roughness and increased ship resistance, which results in higher fuel consumption for the same transport work.

Hull biofouling is conventionally controlled by applying an underwater hull coating containing biocides, so-called antifouling paints (AF). Alternatively, non-toxic solutions are already commercialized, which rely on self-cleaning properties of the top layer – so-called foul-release coatings (FR) – or hard coatings that require frequent underwater cleaning – so-called surface treated composites (STC).

Problem description:
Auto-logged performance data is available for four Ro-Ro vessels from a collaborating shipping company. These vessels underwent coating retrofit in the dry dock: from a conventional biocide-containing AF coating to a non-toxic STC coating. The question posed is whether such retrofit had any measurable effect on fuel economy and emissions to air. Additionally, aspects such as painting costs and cleaning logistics need to be addressed.

Implementation:
In this project, data from the four Ro-Ro vessels will be analysed for determining hull performance throughout time. More specifically, percentage speed loss and equivalent hull roughness height will be determined, using a method based on the recent ISO 19030 standard. Additionally, economic and logistic aspects related to painting and cleaning would be covered, namely through comparison of the life-cycle costs of each coating option: conventional paint versus non-toxic alternative.

Work: short literature review, collection of required data, data processing, determination of hull performance values and analysis of life-cycle costs.
Number of students: 2 (recommended).
Requirements: background in basics of ship hydrodynamics, data analysis, and basic introduction to Matlab language.
Start: spring 2019.
Extent: 15 cu (1 study period).
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