Baltic Marine Environment Protection Commission

Maritime Group
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Background

The settlement and growth of marine organisms (bacteria, fungi, protozoa, algae and invertebrates) i.e. biofouling on the underwater surfaces of vessels increases drag, and consequently fuel consumption and greenhouse gas emissions, and additionally facilitate the translocation of potentially invasive marine species.

The Finnish commercial diving company DG-Diving Group Oy is developing an environment friendly in-water cleaning system for submerged hull surfaces without damaging antifouling coatings. Several cleaning tests have been conducted and process water analyses made to prove the effectiveness of the system in Helsinki, Turku, Naantali and Rauma harbors in Finland in 2015. Some tests have been conducted also in Malmö harbor in Sweden.

As this in-water cleaning system of submerged hull surfaces seems to be an effective way to decrease fuel consumption and accordingly CO2 emissions, it would be beneficial to discuss, among the Baltic Sea countries, what are the rules and regulations related to this kind of activities in the HELCOM Member States, and further on, to consider if there is a need for a new HELCOM Recommendation on ship hull cleaning systems.

Action required

The HELCOM MARITIME 15 meeting is invited to discuss the issue and take note of this document.

Preliminary Results from an Environment Friendly Cleaning System to remove biofouling organisms from underwater ship hull surfaces

Introduction

The settlement and growth of marine organisms (bacteria, fungi, protozoa, algae and invertebrates) i.e. biofouling on the underwater surfaces of vessels increases drag, and consequently fuel consumption and greenhouse gas emissions, and additionally facilitate the translocation of potentially invasive marine species.

Biofouling prevention or minimization is most commonly achieved by the application of antifouling coatings, which prevent the settlement of biofouling organisms through the continuous release of a biocide or biocides at the paint surface. In recent times, non-toxic coatings, which do not prevent but minimize the strength of adhesion of biofouling, and hard, scrubbable coatings that require regular cleaning to prevent biofouling accretion, have also been adopted as alternatives to biocidal antifouling coatings.

In-water cleaning system for submerged hull surfaces

The Finnish commercial diving company DG-Diving Group Oy is developing an environment friendly in-water cleaning system for submerged hull surfaces without damaging antifouling coatings. Several cleaning tests have been conducted and process water analyses made to prove the effectiveness of the system in Helsinki, Turku, Naantali and Rauma harbors in Finland in 2015. Some tests have been conducted also in MaImö harbor in Sweden.

In-water cleaning of the submerged hulls of vessels can:

- Remove slime and biofouling organisms to improve hull and fuel efficiency;
- Remove biofouling epiphytes and attached animals after periods of vessel lay-up or low activity;
- Maintain foul release or scrubbable coatings; and
- Remove potentially invasive marine species. (Reference: Fisheries Occasional Publication No. 114, 2013, Report 1, In-water hull cleaning and filtration system: In-water cleaning trials 26-28 November 2012, Government of Western Australia, Department of fisheries, page 7).

This in-water cleaning system has been used to clean ro-ro, ropax and cargo vessels and oil tankers. In the northern Baltic Sea the first cleaning is most often done c. one month after the ice cover has melted. After that roro and ropax vessels are usually cleaned twice a month, cargo vessels once a month.

The cleaning system has two main components: a cleaning machine (Fig 1.) and a process water treatment unit. The cleaning machine used by a diver (Fig. 2) is able to remove all biofouling organisms (epiphytes and attached animal species) from submerged hull surfaces without damaging antifouling coatings.

Figure 1. A cleaning machine unit for in-water cleaning system.

Figure 2. A diver is cleaning the hull with the cleaning machine unit.

All detachable biofouling organisms are removed with cleaning process water to the water treatment unit on shore. This unit is able to separate biofouling organisms from the cleaning process water and also remove nutrients, phosphorus and nitrogen, from cleaning process water (Fig.3). After purification of process water it is clean enough to be discharged to the sea during the ship cleaning work. All solid waste will be collected and handled in a proper way on shore.

A B

Figure 3. A) Process water containing algae, barnacles etc., B) Purified process water.

Discussion

DG-Diving Group Oy has been testing this cleaning system mainly in the Finnish harbors, but the very first tests have been conducted also in Malmö harbor, in Sweden.

As a result of the tests can be stated the following:

- Underwater surfaces of vessels can be cleaned in a cost effective way by using a machine to remove and collect fouling organisms
- Cleaning and nutrients removal from the process water is possible and effective

Results from a water analysis indicate, as an example, that it is possible to clean the process water from nutrients (nitrogen and phosphorus) to the level of ambient sea water. The water analysis was conducted in an Accredited Laboratory in Turku Finland in August 2015.

Our order 182505 (DG-DIV/NAANSAT), Date of receipt 10.8.2015

SAMPLES

Lab. number	Description
14595	Referens
14596	Before filt.
14597	Filtered

RESULTS / SAMPLES

Analysis	Unit	14595	14596	14597
Temperature	°C	P		
Turbidity *	FNU	2,7	210	9,7
Suspended solids (Nuclepore 0.4µm) *	mg/l	4,5	980	23
Total phosphorus *	µg/l	41	3100	32
Total nitrogen *	µg/l	560	2400	520

P =analysis uncompleted, E = analysis undone, ~ = approximately, < less, << less or equal, > greater, >> greater or equal.
* = Accredited analysis ISO/IEC 17025:2005. (FINAS accredited laboratory T101).

OPINION

The samples were taken by DG-Diving Group. According to the orderer sampling site was in the port of Naantali.

Figure 4. Results from a water analysis as an example from August 2015.

Clarification needed for Rules and Regulations in the Baltic Sea area

There are differences in rules and regulations concerning the underwater hull cleaning among the Baltic Sea countries. In Finland it is allowed to clean underwater hull surfaces in ports, and for example in Sweden it is forbidden without cleaning of the process water.

As this in-water cleaning system of submerged hull surfaces seems to be an effective way to decrease fuel consumption and accordingly CO_2 emissions, it would be beneficial to discuss among the Baltic Sea countries, what are the rules and regulations related to this kind of activities in the HELCOM Member States, and further on, to consider if there is a need for a new HELCOM Recommendation on ship hull cleaning systems.