Corrosion Assessment

Executive Summary

The on board ballast water treatment systems act on the water and consequently may modify the ballast water properties and contents.

In ships, an important problem is the corrosion of the hull structure, the piping system and the ballast water handling equipment. Therefore it has been decided to identify if the installation and operation on board of the considered in the MARTOB project ballast water treatment systems will modify the water properties in such a way that it could increase the corrosion risk of the ship structure and ballast water piping network.

The target of this task was not to perform a detailed analysis of the corrosion risk link to each system which will require to know all details about the ship on which they will be installed, but to provide a warning to the designers and classification societies which will have to approve the installation on board, on the main possible new risks with respect to corrosion attached to each system.

As the task concerns the identification of a corrosion risk increase within the scope of a classification society concept approval, it has been decided to consider valid an Expert group opinion, opinion formalised by using a FMECA grid support. The FMECA grid and the ranking tables has been developed by the Expert group.

The ballast water corrosive action has been considered on the ship and piping steel components, ship frame and piping coatings and piping network gaskets.

The review of the FMECA analysis results, allows to recommend to pay attention for the on board ship installation to the following points:

BenRad Oxidation method

- A moderate increase of the Redox potential (short term effect) with possible consequences on metal corrosion, coatings and gaskets.
- A slight increase of CO2 (order of mg/l) with possible consequences with respect to metal corrosion and coatings.

Oxicide method

- The use of DC equipment with possible non expected current return paths and possible localised significant metal corrosion.
- A significant increase of the Redox with possible consequences on metal corrosion, coatings and gaskets.
- The production of H2O2 with possible consequences on metal corrosion, coatings and gaskets

Biological de-oxygenation method

- A slight decrease of the pH with possible consequences on metal corrosion, coatings and gaskets.
- A slight increase of CO2 (order of mg/l) with possible consequences on metal corrosion and gaskets.

- The production of H2S (order of mg/l) with possible consequences on metal corrosion, coatings and gaskets.
- The addition of inorganic substances with possible consequences on metal corrosion, coatings and gaskets.
- The addition of organic substances with possible consequences on coatings.
- A significant increase of the bacteria concentration with possible consequences on metal corrosion, coatings and gaskets.
- Due the fact that the heater is followed by a cooler and is located at the discharge of ballast water, no risk of corrosion increase or risk with respect to coating and gaskets has been identified.

Ultraviolet method
- A slight increase of the Redox potential (short term effect) with possible consequences on metal corrosion, coatings and gaskets.

Ultrasound method
- No risk of corrosion increase or risk with respect to coating and gaskets has been identified.

Ozone method
- A significant increase of the Redox potential (short term effect) with possible consequences on metal corrosion, coatings and gaskets.
- The production of O3 (short term effect) with possible consequences on metal corrosion, coatings and gaskets.

In conclusion, all risk increases are acceptable with respect with today knowledge and can be managed for new ship design with existing techniques and methods.

Referring existing ships, some treatment systems may be not acceptable due to the treated water characteristics incompatibility with the existing piping, gaskets or coatings materials.