STUDY OF CHEMICAL AND MICROBIAL FACTORS AFFECTING THE CORROSION IN BALLAST TANKS ON BOARD OF MERCHANT NAVY VESSELS

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Corrosion in double hull ballast tanks is a very specific issue, influenced by numerous circumstances such as high humidity, presence of sea water, alternation between wet and dry, high temperature, dissolved oxygen, microbial influenced corrosion, complex constructions with a lot of welding, flexibility of constructions, pollution of the ballast water, marine fouling, use of inferior steel from recycling, insufficient maintenance and coating.

As a consequence, many different types of corrosion exist, each having its own effects and mechanisms.

Protection of ballast tanks is difficult for numerous reasons such as accessibility of the tanks, lack of adequate protection methods and cost of proper maintenance.

The goal of the project is to find correlations between quantifiable parameters and corrosion in double hull ballast tanks, through multivariate statistics.

For this project, ships' ballast tanks are inspected. During these inspections, the tank condition is evaluated. Pictures of the tank structure and samples of the water, mud and rust are taken. These samples are then chemically and microbiologically analyzed.

During sampling as well as later on in the laboratory, a number of relevant parameters are selected. The objective is to establish a correlation between the intensity of the corrosion and these selected parameters. For this goal traditional multivariate statistic techniques are used, such as principle component analysis. Correlations are searched between the different numerical parameters (the quantification of the corrosion and the chemical analysis) and the discrete properties (bacteriological analysis) of the samples. The outcome is plotted on a multidimensional coordinate system.

These plots show relevant correlations, possibly creating a better insight into the causal links between corrosion, the chemical and microbial processes. For the statistical work an open source package R is used. The department of applied biological sciences has ample experience with this application.

The ultimate goal of this scientific research is a ready made solution to the corrosion problem in ballast tanks.