Summary

Biofouling of ships has been a problem for centuries and remains that today. From the literature research it can be concluded that the increase in hull resistance by biofouling has significant negative influence on the performance and cost of shipping operations. Although fouling pressure, the growth speed of biofouling, is not identical across the world, it is a global problem, influencing trade and product prices everywhere.

The goal of this research is assessing the available marine fouling prevention methods used on ships to create an analysis which can provide data for selecting the method which is most cost-effective. Several aspects such as cost of fuel consumption, cost of loss of speed, growth speed of fouling, maintenance procedures and regulations were taken into account.

The antifouling method regarded as the most effective, tributyltin self-polishing co-polymer (TBT-SPC), was recently banned because of its demonstrated adverse effects on the marine environment. Although this stance was questioned by multiple parties, the ban came into effect on September 17, 2008. The ban led to a revival of research for alternative methods to counteract biofouling.

A lot of alternative antifouling systems have meanwhile been developed, of which several are not as effective as TBT-SPC. The most promising are the non-stick surface treated coating (STCs), which require periodical maintenance in the form of cleaning. Cost calculations show that these coatings have the potential of reducing a ships' fouling costs compared to TBT-SPC. The frequency of cleaning is dependent on two factors: (1) The increase of cost by increased hull resistance over time and (2) the cost of cleaning. A balance between these two factors should thus be found to find an optimum point where overall costs are minimal.

Cleaning ships' hulls has been done for decades now, underwater and in dry-docks. It has been shown that cleaning is a very viable option, although a lot of uncertainties remain on the costs of machines that are quick enough to clean an entire ship during on and offloading. However a lot of patents exist on the cleaning of ships' hulls underwater, technical feasibility of constructing an underwater cleaning system thus seems not to be an issue. Getting the ship owners convinced of using cleaning systems is the challenge. The risk of this endeavour seems relatively small, because the cost of cleaning can increase by at least a factor 4 compared to current cleaning costs, and still be viable.

It can thus be concluded that non-stick surface treated coatings and cleaning are both feasible options. Not only can both methods maintain the same antifouling costs as was needed with TBT-SPC, a substantial cost reduction is likely. The greatest asset of both methods is the fact that they have great

potential of being significantly less harmful to the local and global marine environment than TBT-SPC and currently available alternatives.

Baring this final conclusion in mind it is recommended to extend research to the exact costs of using cleaning robots, automatic or diver assisted, as fouling management system. The cost calculations from this research should then be reassessed and carried out in more detail to create a realistic view of the possible improvement.