Highlights.

Stefan Eliasson
President & CEO

I believe it has been a long time since we last faced so many big, global challenges. We are facing a changing climate. We are facing political situations creating uncertainty in many countries. We are facing the potential for an escalating trade war between the economic superpowers in the world.

Most of these challenges affect the maritime sector, and some of them possibly present a bigger challenge for maritime business than other sectors.

Personally, I believe that the hardest will be how the shipping community solves the environmental requirement set by the International Maritime Organization (IMO) to reduce greenhouse gas (GHG) emissions for all international shipping by at least 50% before 2050.

There is still an open question surrounding how we can solve this, and I don't think anyone currently has the answer. However, I am convinced that the answer will not be one big-fix solution for the problem, but rather several small, efficient solutions that combine to achieve the required levels for reduced emissions.

SSPA wants to be a part of the solution, and we will be dedicated to optimising maritime systems for a reduction in GHG emissions now and in the future. We believe strongly that a very good first step towards meeting the objectives is to reduce fuel consumption.

This edition of Highlights contains articles that address research results on how to reduce the environmental footprint from shipping. The result may not be ground-breaking, but it shows that there are several actions that we can take.

Another area that the IMO and other international maritime organisations are focusing on is how to improve safety within maritime operations. This is also an area where many small steps will add up to a big change.

SSPA is devoted to being part of the development to ensure and improve safety at sea, which is why you will find several articles describing, in a broad sense, how we can assist the maritime sector in improving their operations safely.

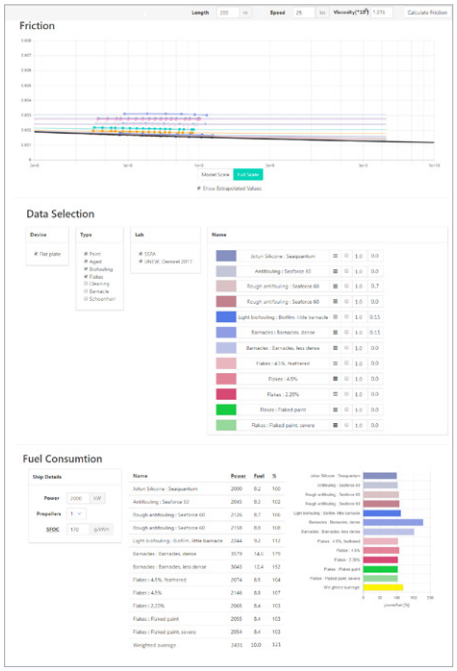
I hope you will find some articles to catch your interest. Pleasant reading!

Skin Friction database for the maritime sector

Skin friction is responsible for 50–85% of the total resistance the ship must overcome to keep its speed. It is therefore important from an economical and environmental point of view to ensure that the cost of increased fuel consumption due to roughness does not surpass the cost of surface maintenance. It is not a trivial task for ship owners and shipyards to decide which coating to use or how often the surfaces should be recoated or cleaned based on cost/benefit analyses. SSPA has completed a research project with the aim to gain increased knowledge of the effect a rough surface has on skin friction. This project has also resulted in an interactive tool that can be used to estimate fuel consumption without requiring background knowledge in hydrodynamics. This tool is the "Skin Friction database", which will hopefully contribute to better surface treatment of vessels, that in the end can reduce costs and emission of greenhouse gases from the maritime sector.

There are several published measurements that link surface roughness to skin friction but none which cover all (or most) of the possible surface topologies seen on vessels. Estimating the increase in delivered power due to deteriorating surface conditions requires insight in relevant literature and the means to convert that knowledge to the influence on skin friction. The goal of the Skin Friction database is to increase the knowledge of rough surface effect on skin friction and create an interactive tool, which can be used to better estimate fuel consumption due to hull roughness.

The database consists of three elements: Model tests of rough surfaces, extrapolation to full scale vessel length and speed and the database interface including a fuel consumption tool.



Skin Friction database interface.

Skin Friction database

Available at https://www.sspa.se/tools-and-methods/skin-friction-database along with instructions, and a more extensive description than available in this article.

The database consists of three elements: Model tests of rough surfaces, extrapolation to full scale vessel length and speed, and the database interface including fuel consumption tool.

Acknowledgement is due to Jotun and the Löven Center as partners, and the Swedish Energy Agency, Region Västra Götaland and MARIA for funding the project. The project will be continued with more emphasis on hull cleaning and Computational Fluid Dynamics (CFD) simulation of rough surfaces in the project "RÅHET" (Roughness) funded by the Swedish Transport Administration.

Definitely not a good solution.

Antifouling coating applied with same procedure as on a full-scale vessel.

7-metre flat plate in SSPA's Towing Tank.

Model tests

A flat plate was used to test various rough surfaces in SSPA's Towing Tank. By applying coatings, growing bio fouling in the ocean and creating simulated surfaces of flaking paint and cleaned surfaces (a total of 16 rough surfaces) and towing the plate through the Towing Tank, measuring the resistance, the skin friction for each surface can be extracted. All rough surfaces tested were chosen to reflect surfaces normally seen on commercial vessels.

The Skin Friction database is an interactive tool, which can be used for better estimates of fuel consumption due to roughness without the necessity for background knowledge in hydrodynamics.

Along with measurements from other laboratories, these results are used and presented in the database interface as input to the extrapolation and the fuel consumption increase estimate also included in the database interface. The extrapolation method consists of Granville similarity for extrapolation in the length dimension and roughness function extrapolation in the speed dimension according to the Towing Tank Conference (ITTC) procedure.

Skin Friction database

The database interface is interactive and consists of the following sections; vessel information, which requires only a minimum amount of information to allow for easy use, and graphs of skin friction in model and full scale. As the number of measured surfaces are quite large and will be increased over time, a filter for displaying surfaces along with additional information about the surfaces (such as roughness height, type and pictures) are available.

Finally, based on the delivered power of the vessel, the fuel consumption increase for each selected surface is presented in absolute numbers and in graphical form.

The measurements completed for the database can be seen as a significant contribution to the volume of skin friction measurements on rough surfaces for the maritime industry. However, the main goal of the database, and the reason to include the interactive interface, is to offer vessel management an easy to use tool to evaluate the impact of rough surfaces on fuel consumption, thus allowing a better cost/benefit analysis of when and how to improve a vessel's surface condition.

Ultimately, it is the hope that the database can contribute to decisions leading to generally better surface treatment of vessels, reducing costs and emissions of greenhouse gases from the maritime sector. The extrapolation and fuel estimation tool are a rather coarse method, but then again so too is determining a vessel's rough surface distribution. More refined estimates can be obtained using Computational Fluid Dynamics (CFD) simulations.

All photos and illustrations by SSPA.

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