

FIR THEORY

Friction Increase Ratio

We have established FIR theory which can estimate the Friction Resistance by measuring and evaluating roughness(Rz) and wavelength(RSm) of the paint surface, and have been carrying out the evaluation of fuel saving effect with more accuracy.

Low Roughness ● Long Wavelength

Low Friction Resistance

Fuel Saving

$$FIR(\%) = 2.62 \times \frac{Rz^2}{RSm}$$

How to calculate the fuel efficiency of your vessel by 3D analysis on the surface profile.

CMP's Leading Edge Technology of **"Fuel Saving AF"**
 A Unique Anti-fouling **"Beyond Silyl"**

SEAFLO NEO Series

Smooth surface roughness by long wavelength play important roles to reduce hull friction. SEAFLO NEO Series are well designed in providing those two functions and achieved low friction and thus can contribute saving fuel.



SEAFLO NEO was awarded Minister of Land, Infrastructure and Transport Prize in 2012, as a successful case of great contribution to the promotion of industry-university collaboration by achieving significant result on development and practical application of the paint which reduces the hull resistance and VOC.

Current AF	Silicone AF (CMP BIOCLEAN)	SEAFLO NEO
Rz= 102μ RSm= 3450μ	Rz= 52μ RSm= 6491μ	Rz= 56μ RSm= 5250μ
FIR(%)=2.62×102 ² ÷3450	FIR(%)=2.62×52 ² ÷6491	FIR(%)=2.62×56 ² ÷5250
FIR 7.9%	FIR 1.1%	FIR 1.6%

FIR7.9% - FIR1.6% = FIR 6.3%

In case of 6.3% of Friction Reduction ÷ **3~5% Fuel Saving**
 (Fuel saving is depending on vessel type and speed)

*Above FIR values are based on the lab data

Reducing the Friction Resistance of the hull bottom leads to fuel saving.

The reduction technology of Friction Resistance by anti-fouling paint for underwater hull is gaining more expectations under the circumstances of environmental regulations for ships, e.g. EEDI (IMO: Energy Efficiency Design Index), since it is claimed that the Friction Resistance is about 60-80% in total hull resistance which greatly affects the fuel consumption of vessels.

CMP, governmental research organization and University jointly developed low friction anti-fouling paint with the concept of "Fuel saving / Low VOC", and also established FIR theory as a method of evaluating the low friction effect, which has been applied for a patent.

Low roughness and Long wavelength bring Low FIR value, that is Low Friction Resistance

Our research and development

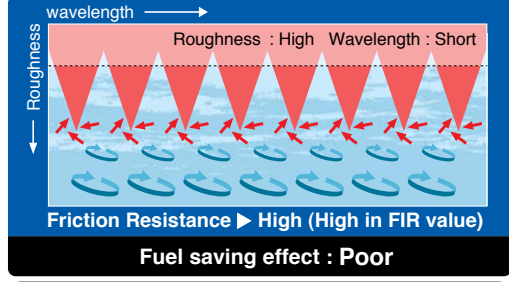
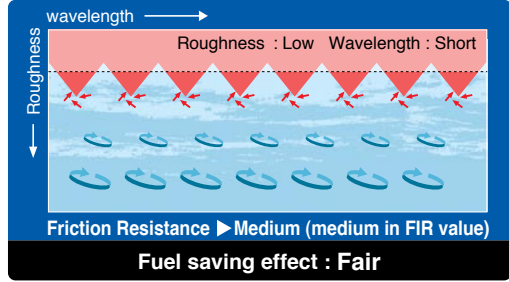
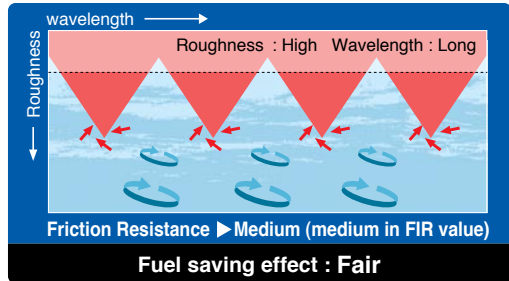
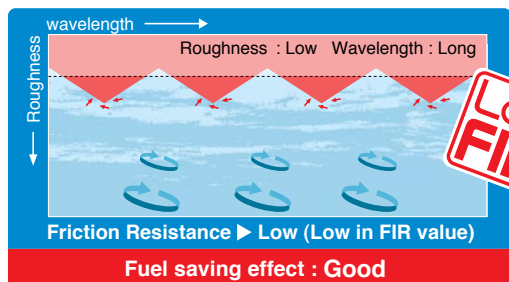
We collect the surface replica data of the actual vessels, other than test data from lab.

Our latest hydrolysis antifouling paint SEAFLO NEO is a new generation paint which was introduced in 2010 through our research and development focusing on low Friction Resistance, and it has been applied to more than 200 vessels.

The expected cost saving amount will be around several hundred thousand dollars, when converting these effects into calculation of the fuel consumption until next dock, although it varies depending on vessel type, size, or operation condition, etc.

It has been reported that SEAFLO NEO was verified to achieve 1-4% fuel-saving at sea trial in newbuilding. However in case during ship sailing after the delivery, it has been claimed that it is difficult to proof whether actual fuel saving effect was caused by paint/paint application because ships are affected by various factors e.g. hydrographic conditions during the sailing. Therefore, the test results from reliable organization and reliable test facility can be a significant indicator.

The fuel saving characteristic of SEAFLO NEO series are well substantiated by fluid mechanism as well as reliable science and technology.



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