Catalogue NO. NPMC-070-E3

Fuel Oil Saving A/F (tin-free, self-polishing type)

LF-Sea

Low Friction Coatings
Less Fuel Consumption
Compete/Counter Silicone type
Cost Saving for Ship Owners/Managers

NIPPON PAINT MARINE

Low Friction Coatings
Less Fuel Consumption

LF-Sea

Introduction

Nippon Paint Marine Coatings is a technology oriented marine paint company. We started to develop the tin-free antifouling eight years before tin ban regulation. The world famous ECOLOFLEX SPC antifouling, thus developed by us, now boasts its massive track records of more than 13,000 vessels so far applied worldwide.

As a green conscious advocate for global environment we developed, in collaboration with Osaka University and Kobe University, the epoch-making LFC antifouling technology.
This technology enables to contribute for environment by reducing friction resistance, fuel oil consumption, and CO_2 & SOx discharge. In the wake of bunker oil price hike, this LFC technology will substantially contribute to save cost for shipowners and shipmanagers.

We seriously studied how marine creatures such as shark, penguin, dolphin and tuna can swim so fast with limited energy inside. We find the evolution they have made ! Riblet skin of shark, air trapping feather of penguin, smooth and flexible skin of dolphin, mucous and viscous skin of tuna....

We succeeded in developing LFC technology patterned after tuna and dolphin skin! We nominated this unique technology as "Water Trapping Mechanism". Data obtained from model ships (3 meter long) towed in 100 meter long tank of Osaka University and regularly navigating ferry boats reveal fuel oil consumption saving of about 4 (four) percent! This fuel oil saving antifouling is branded "LF-Sea".

Nippon Paint Marine Coatings keep innovating and pioneering new coating technology to fight against global warming.

FEATURES

1. Hydrolytic A/F for 5 year -Copper Silyl Acrylate Copolymer-
2. Low friction / Fuel saving A/F
3. Lower friction by water trapping mechanism + Ecoloflex SPC (HyB) antifouling performance.
4. Much more cost effective than silicone type and easy budgeting for shipmanager.
5. Applicable directly on the existing tin-free antifoulings without blasting.
6. Applicable with current painting tools and conditions. No special workload needed.

MERITS

- Bunker oil saving (4%)!
- Application cost saving and less application investment than silicone type.
- Environment friendly with less fuel oil consumption, less CO_2 / SOx discharge.

Model ship test

(using Towing Tank)

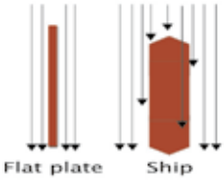
In Osaka University, model ship (3 meter long) was towed in the tank of 100 meter long.
Three types of model ship (*LFC AF, *Current AF, *No coating) were used to investigate the frictional performance and its comparison.


※OSAKA UNIVERSITY


LFC AF applied


CURRENT AF applied

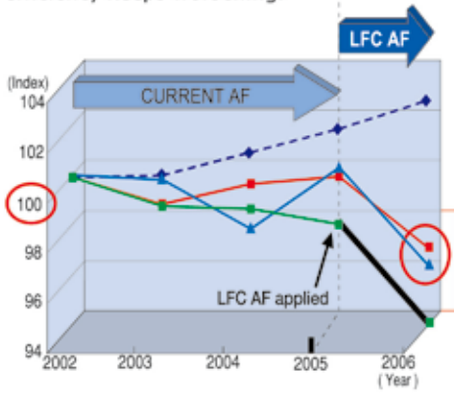

No coating applied



LFC effect thus verified!

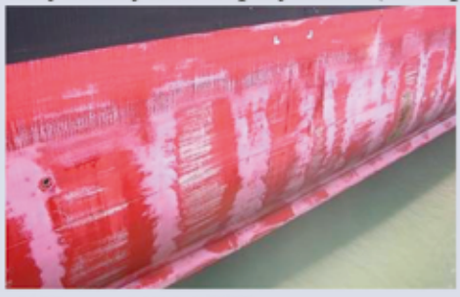
Ferry E 2002 to 2006 (5 years)

Data 2006 is a result of the LFC AF applied at previous dock in 2005.
Lowest fuel consumption data is recorded in 2006, which verified LFC effect even engine efficiency keeps worsening.



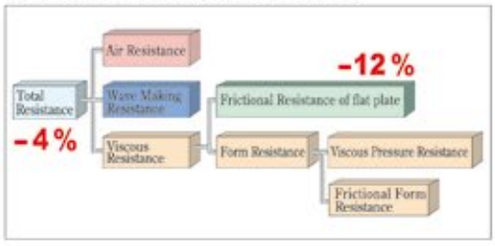
Hydrolytic self-polishing A/F -Copper Silyl Acrylate Copolymer- (A/F performance of Ecoloflex SPC 250 HyB)

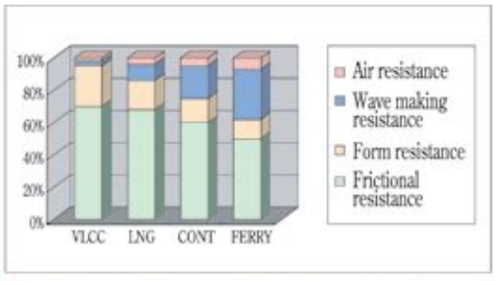

* LPG * 50,741 DWT
* 15 knots * Japan - PG
* In-service period : 30 months


* LNG * 62,510 DWT
* 15 knots * Japan - Australia
* In-service period : 30 months


* VLCC * 258,000 DWT
* 16 knots * Japan - PG
* In-service period : 30 months

* Resistance components in navigation





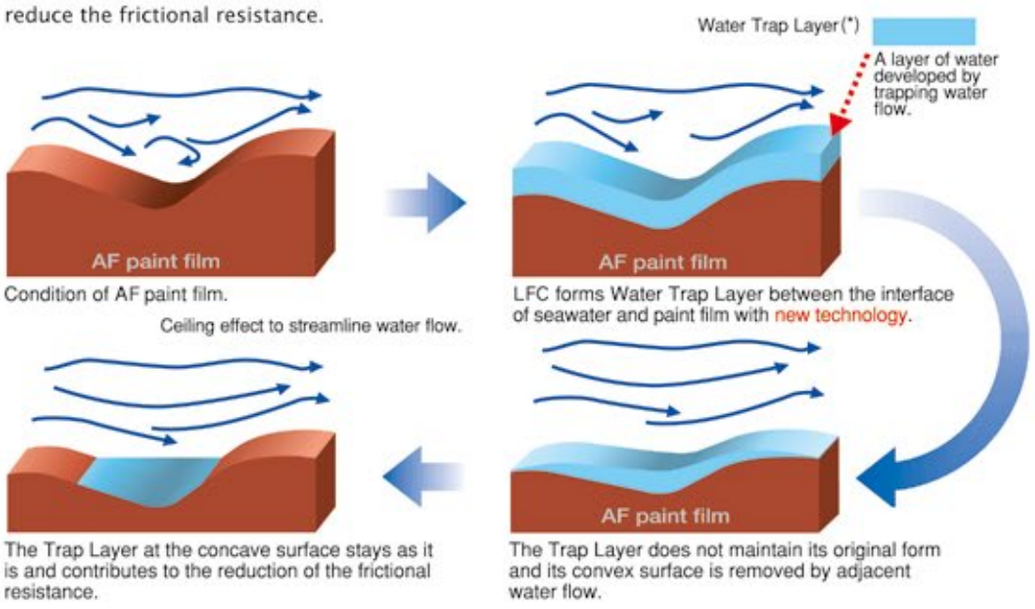
KEY FRICTION our AF challenged to reduce

Fig. Example of resistance components in ship navigation

LFC Mechanism (1)

(Image Illustration)

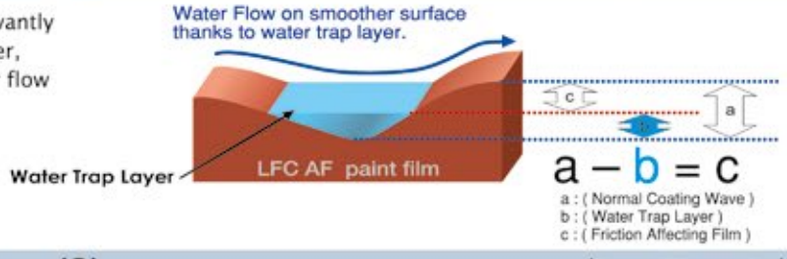
This illustrates how Water Trap Layer works to reduce the frictional resistance.



LFC Mechanism (2)

(Image Illustration)

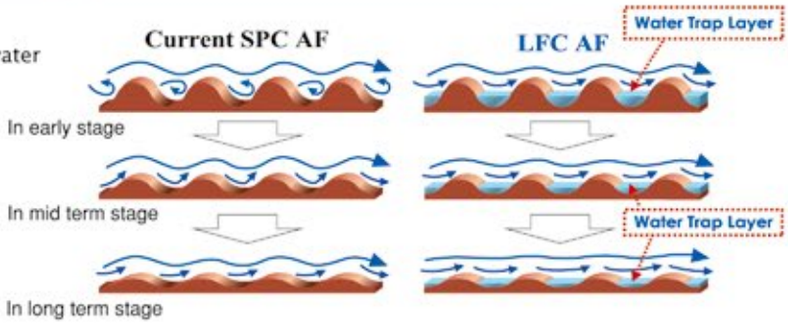
LFC AF paint film is relevantly off-set by water trap layer, leading to smooth water flow and to reduce frictional resistance.



LFC Mechanism (3)

(Image Illustration)

Self-polished surface becomes smoother by water trapping mechanism.



Keeps worsening

- Engine Efficiency
- FO (L) / Distance
- FO (L) / Hour
- Fuel Efficiency
- LFC effect

FOC reduction !
LFC effect
4%

* VLCC * 259,079 DWT
* 14 knots * Japan - PG
* In-service period : 30 months

* LPG * 49,999 DWT
* 15.8 knots * Japan - PG
* In-service period : 30 months

* LPG * 49,998 DWT
* 16 knots * Japan - PG
* In-service period : 30 months

SAFETY PRECAUTIONS

This product is slightly more toxic than the other paints of ordinary use. Inhaling of the vapours and skin contact with the paint might cause poisoning and a rash. Therefore, when handling, please refer to the following precautions.

HANDLING AND STORAGE OF OUR PRODUCTS

1 Application must be conducted in an area equipped with local air exhausters and free from flame.
2 Take the preventive measures to electrostatic discharge.
3 While painting and drying, ventilate thoroughly and avoid inhaling the fumes or gases. During the application outdoors, seal the air vent etc. of houses in neighbourhood to keep the fumes or gasses out.
4 When handling, protect your skin wearing, for example, organic gas protection mask, air-supplied respirator, hood, safety glasses, long-sleeved work clothing, towels, gloves, aprons, and so on.
5 After the application, rinse your mouth and wash hands thoroughly so that the paint and so on are removed.
6 Keep the container closed and store at temperatures below 40℃.
7 Soak the paint dust and slag in water until they are disposed.
8 Store any product in the place out of children's reach.
9 Avoid suspending of the container. If necessary, use an appropriate device and lift it vertically.
10 Do not use the products for improper purposes.

EMERGENCY PROCEDURE

1 If a fire involving paint does occur, use CO_2, foam or dry chemical extinguisher.
2 If the paint and so on get in your eyes, wash off with water and take medical advice from a doctor immediately.
3 If the paint splashed on your skin, wash off with soap and water. When you feel pain or find any change in the appearance of the skin, consult a doctor immediately.
4 If you feel sick after inhalation of fumes, gases etc., lie quietly and, when necessary, consult a doctor immediately.
5 If you swallow the paints by mistake, consult a doctor immediately.
6 If the contents spill out of the container, wipe it with a piece of cloth and soak in water.

WHEN DISPOSING, TREAT THE WASTE MATERIALS AS INDUSTRIAL WASTES.

For detailed information, please refer to the Material Safety Data Sheet (MSDS).
Please consult us beforehand when you are going to export them.

NIPPON PAINT CO.,LTD. 2-1-2 Oyodo-kita Kita-ku, Osaka, 531-8511, JAPAN
TEL.06-6455-9399 FAX.06-6455-9275

Product List & Standard Spec. for Ocean-Going Vessels

Product	Type of Paint	Type of Ship	Newbuilding Standard Spec
LF-Sea 150 HyB	Copper Silyl Acrylate Copolymer	PCC Container	60 M spec. (17~20 knots) V/B: 3 x120 μ, F/B: 2 x115 μ
LF-Sea 250 HyB	Copper Silyl Acrylate Copolymer	All Ocean-Going ships	60 M spec. (15~17 knots) V/B: 3 x140 μ, F/B: 2 x135 μ

Please consult with Nippon Paint Marine Coatings as the above shows standard DFT and may differ depending on the ship's operating conditions.

Challenge for frictional resistance reduction

TUNA and DOLPHIN are our teacher.
They teach us how the antifouling coating surface should be formed for less friction and less energy.

LFC : Viscous & Slippery surface like Tuna & Dolphin skin

Surface is coverd with mucosa, and this helps Tuna swim at 160km ph.

Smooth & flexible surface help Dolphin swim fast.

Wisdom of Evolution

We found out phenomenal function of tuna and dolphin skin is a secret for them to keep swimming very fast without consuming big propellant energy.
This hints and induces us to develop Water Trapping Technology.

NIPPON PAINT MARINE COATINGS

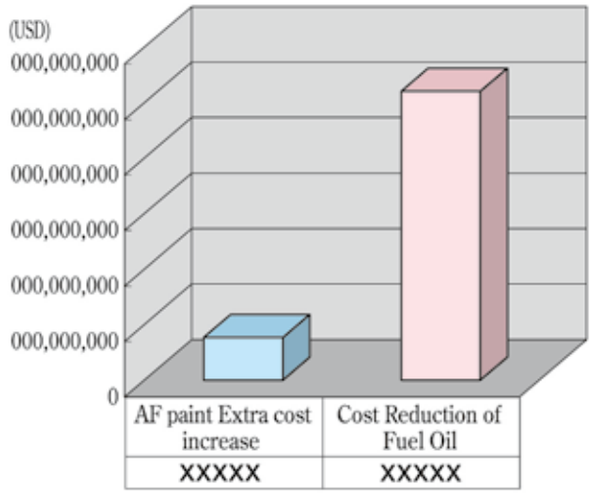
COST IMPACT SIMULATION =Sample=

Vessel Name

Item ↓				
1 Type of Vessel		XXXXXX		
2 Size of Vessel		XXXXXX	DWT	
3 Speed		XX	Knots	
4 Service Life	Input	XX	Month(s)	
5 Amount of Fuel Oil (per day)	Input	XXXXX	KL	
6 No. of Operating day (per year)	Input	XX	Days	
7 Amount of Fuel Oil (per year)	Auto	XXXXX	KL	
8 Amount of Fuel Oil (per month)	Auto	XXXXXX	KL	
9 Amount of Fuel Oil between dock	Auto	XXX	KL	
10 Unit Price of Fuel Oil	Input	XXXXXXXX	USD/KL	
11 Cost of Fuel Oil between dock	Auto	XXXXXX	USD	
12 **LFC EFFECT**	Input	4.0	%	
13 Cost Reduction of Fuel Oil between dock	Auto	XXXXXX	USD	
14 Q'tity of AF at dock (Current)	Input	XXXX	Litre ---------	
15 Unit Price of AF (Current)	Input	XX	USD per Litre	
16 Value of AF (Current)	Auto	XXXXX	USD	
17 Q'tity of LFC AF	Input	XXXX	Litre ---------	
18 Unit Price of LFC AF	Input	XX	USD per Litre	
19 Value of LFC AF	Auto	XXXXXX	USD	
20 AF paint Extra cost increase	Auto	XXXXXX	USD	
21 **Total Cost Saving Value**	Auto	XXXXXX	USD	

Presumed CO_2 Reduction

XXXX ton between dock



Q'tity of Current AF paint to be calculated.

*Current AF →

** Q'tity of LFC AF paint to be calculated.*

*LFC AF → LF-Sea 250 HyB

* How many months needed for investment recovery ?

XX Months (←Item 20÷Item13×Item4)

NIPPON PAINT MARINE

2-1-1, Oyodokita, Kita-Ku, Osaka 5310-8511 Japan
nippe-marine.com

KB0321