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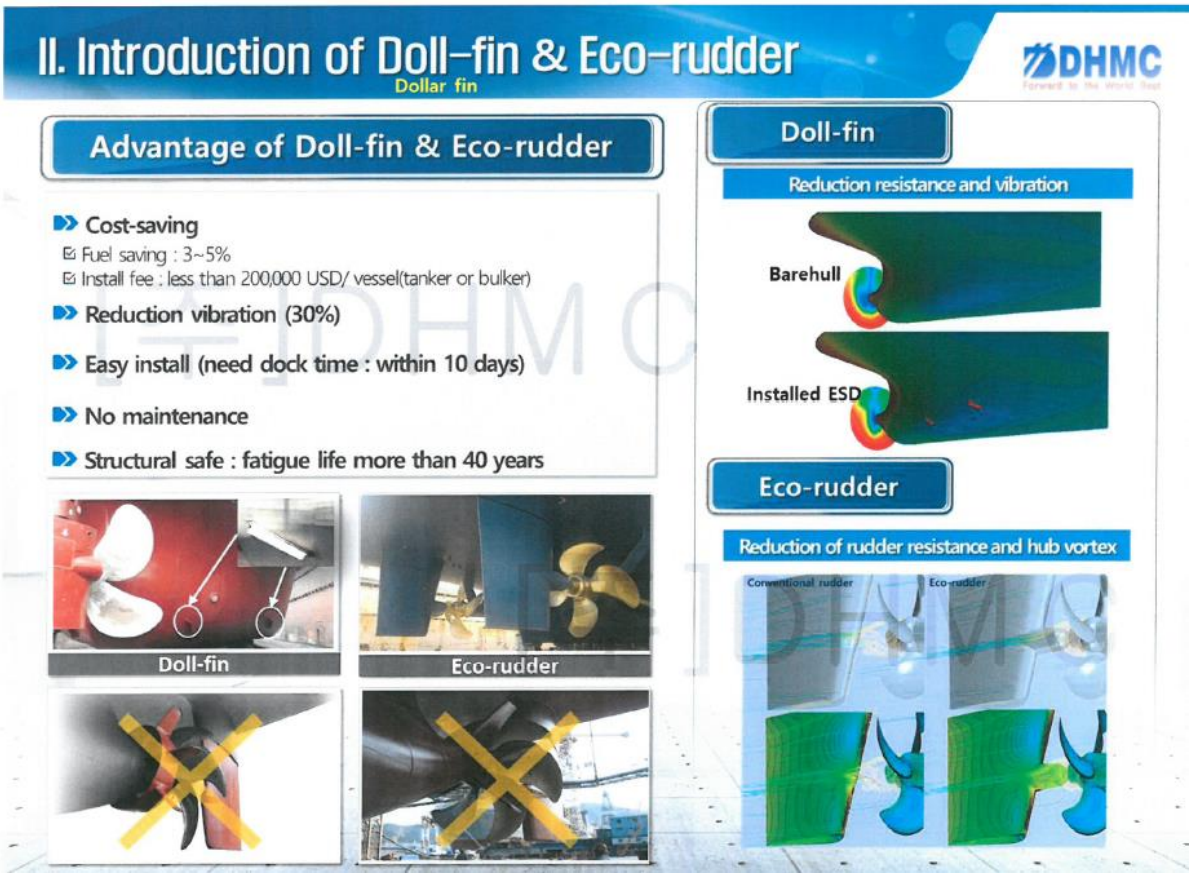
ENERGY SAVING DEVICES | DOLL-FIN & ECO-RUDDER

As fuel is going up high in the sky nowadays, shipping companies tend to protect their good vessels and their expenses! Thus we would like to introduce you the most convenient solution to your problem: **Installation of Doll-Fin & Eco-Rudder, two brand new energy devices!**

PMS S.A. is the exclusive agent in Greece of the Korean Company DAECHUN INDUSTRIAL CO. LTD., global suppliers in Offshore & Shipbuilding, who run business since 1981. For the last 30 years, the company has spearheaded shipbuilding and offshore based on its commitment to reliability and pioneership.

The purpose of these devices is the reduction of the fuel consumption in combination with money saving, compared to other devices.



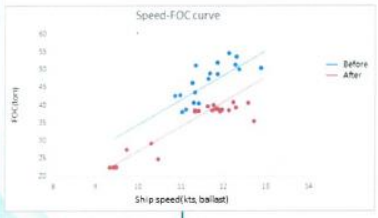
V. Operation results

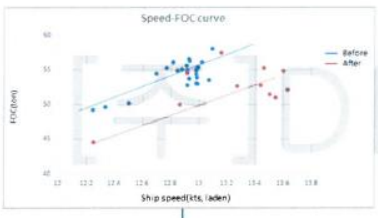
Hull vibration reduction

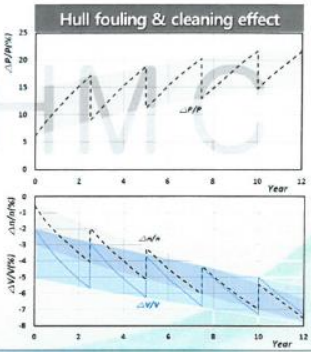
Location	Before retrofit(mm/s)	After retrofit(mm/s)	Reduction ratio
Wing bridge STBD	0.59	0.44	26 %
Wing bridge PORT	0.51	0.33	35 %
S/G Room	0.66	0.48	27 %

» About 30% reduction of vibration level

Fuel saving for VLCC



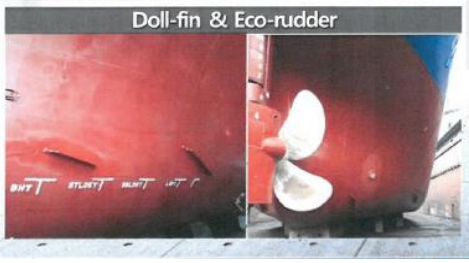




- Reduction of FOC after retrofit : abt. 12 %
  - Hull cleaning effect : 7 %
  - Saving effect by ESD : 5 %
- Reduction of FOC after retrofit : abt. 11 %
  - Hull cleaning effect : 7 %
  - Saving effect by ESD : 4 %

VII. Performance records

Vessel type	ESD	CFD	Fuel saving		Vibration reduction		Maneuvering (Rudder lift force)		Project Name
			Model test	Full scale (Actual result)	Model test	Actual test	CFD	Model test	
4k Bulker	Doll-fin Eco-rudder	5.3 %	4.5 %	7 %	30 %	25 %	-	-	Retrofit(Gov.)
12k Tanker	Doll-fin Eco-rudder	4.5 %	5.5 %	4 % (Only Doll-fin)	20%	-	-	-	Retrofit(Gov.)
VLCC #1	Doll-fin	4.5 %	-	4 %	-	-	-	-	Tech service
VLCC #2	Doll-fin	3.6 %	-	-	-	-	-	-	Tech service
143 m Ropax	Eco-rudder	3.0 %	3.5 %	-	-	-	28 %	33 %	New building(Gov.)
1,000TEU Cont.	Eco-rudder	2.6 %	-	-	-	-	20 %	-	New building(Gov.)
700TEU Cont.	Eco-rudder	2.9 %	2.6 %	-	-	-	8 %	-	New building(Gov.)



Below you can see the comparison between Doll-Fin & Eco-Rudder and Mewis Duct. It is obvious that the cost of the installation is much lower in these devices than the Mewis Duct device.

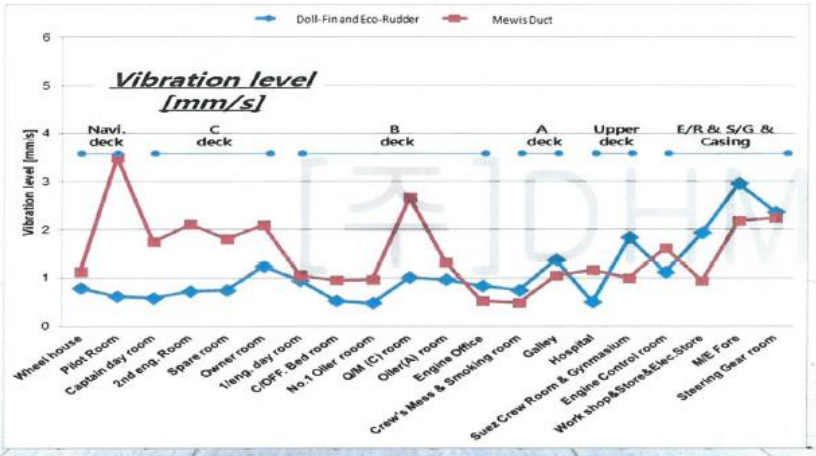
Full scale performance for 35K BC

DHMC

Summary of environmental conditions in sea trial

Item	Doll-Fin and Eco-Rudder	Mewis Duct
Signi. Wave height	1.8m	0.9m
Wind speed and dir.	25kts/220deg	5kts/115deg

Comparison of vibration level

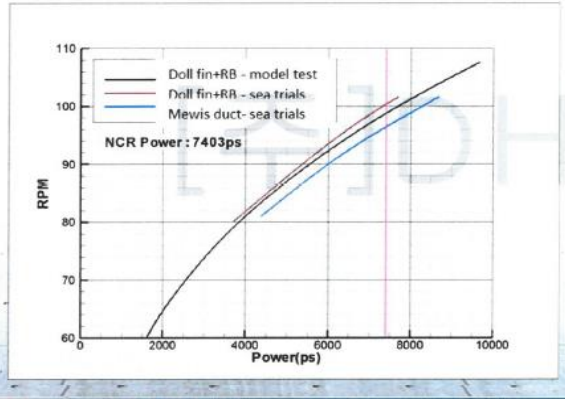


Full scale performance for 35K BC

DHMC

Comparison of energy saving effect

Speed	Doll-Fin and Eco-Rudder	Mewis Duct
Saving effect in Model Test	4.8%	4.3%
Model Basin	SSMB (Samsung Ship Model Basin)	SVA(Potsdam Model Basin)
Saving effect in sea trial	7.4% (based on ship speed of bare hull in model test)	3.1% (based on ship speed of bare hull in model test)
RPM margin	5%	1%



Comparison of Fin Type & Duct Type

DHMC

No	Items	Fins Type [A]	Duct Type[B]	Remarks
1	Performance	3	2	Refer to forward page
2	Productivity	3	1	Manufacturer
3	Design Lead-time	3	2	A: Two(2) Month B: Six(6) Month
4	Fabrications	3	1	A: Seven(7) Days B: Seventy(70) Days
5	Total Engineering Cost [Afra max. class]	3	1	A: about US$ 150,000 B: about US$ 400,000
6	Installation Cost	2	2	Shipyard Responsibility
7	Install Duration	3	2	A: Four(4) Days B: Twelve(12) Days
8	Hull Light Weight	3	1	A: Two(2) tons B: Twenty(20) tons
9	Further Maintenance	3	2	Periodical Inspection, Damage, Repair, etc
10	Handling	3	1	Shipyard

Sample : Good 3, General 2, Below general 1

All shipping companies should be prepared for the future! We are ready and well prepared to assist you, using also a primary study, if you intend to install these units.

For more information, you could always visit our website to download their brochure**.**

Please do not hesitate to contact us as we would be pleased to assist you with any requirement you may have.

Best Regards,

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