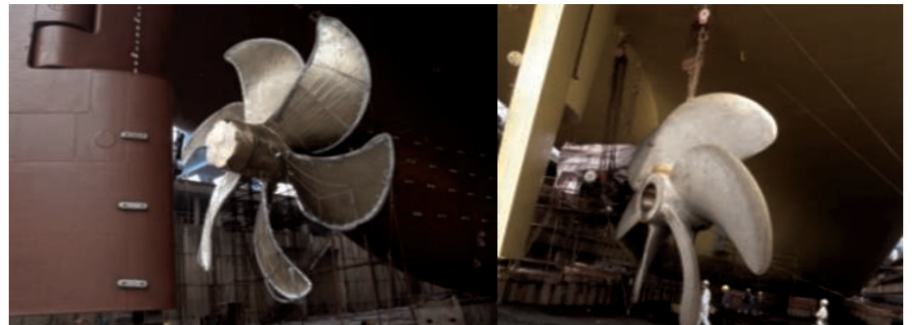




The Quality Provider

MITSUBISHI PROPELLER & HFVC

We are pleased to announce our principals' MITSUBISHI latest news, concerning Energy Saving as well as Improvement of Fuel Efficiency and Reduction of F. O. Consumption.



You may be assured that we and our principals MITSUBISHI will offer to your esteemed company the very best in efficiency and we are looking forward to cooperating with you in all future spare parts and service queries.

Should you require any further clarification or relevant quotation, please do not hesitate to contact us.

❖ **General
Presentation
of
MITSUBISHI
Propeller
Retrofit**

❖ **Energy Saving
Device -
HFVC (Hub
Vortex Free
Cap)**

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Proposal of Mitsubishi Propeller Retrofit

- Mitsubishi latest propeller design is applied.
- Propeller design is based on vessel's condition with considering fouling and aging.
- Propeller design is considered for low load operation by the limitation of main engine load.
- Trade in existing propeller with retrofit propeller

Improvement of
fuel efficiency with
applying the suitable
design for
Low load operation.



Minimization of
Investment



Propeller Retrofit Saving Validation

After propeller retrofit work, MHI-MME carries out the evaluation of the propeller retrofit for many projects which vessels only applied propeller retrofit not applied balboas bow modification and/or propeller duct fitted.

Ship Type	TEU	Ship Num.	M/E Output (Original)	New Power & MCR	After replacement Delivery	Retrofit Saving Validation by actual ships
CONTAINER	5,000	1ship	48,630kW	29,180kW (60%)	2015/Feb	more than 8%
CONTAINER	5,700	3ships	54,810kW	30,150kW (55%)	2015/Jul	more than 10%
TANKER	AFRAMAX	1ship	11,770kW	11,770kW (100%)	2013/Jul	More than 3~4%
LNGC	135,000m ³	1ship	26,800kW	26,800kW (100%)	2015/Feb	more than 4%

➡ You can improve the vessel efficiency only for apply new design propeller !

Solution for Initial Cost Saving

To minimize the initial cost;

(1) Exchange at Dry Dock

**(2) Trade in Existing Propeller with
Retrofit Propeller**



**Retrofit
Propeller**



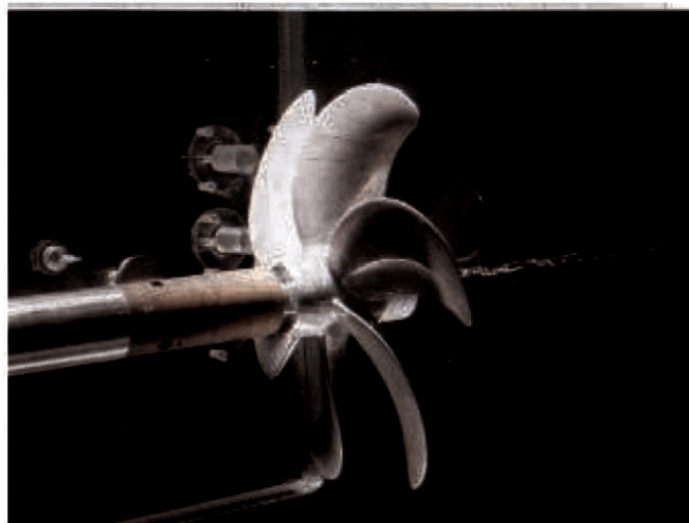
**Existing
Propeller**



with HVFC



without HVFC



HVFC recover a loss

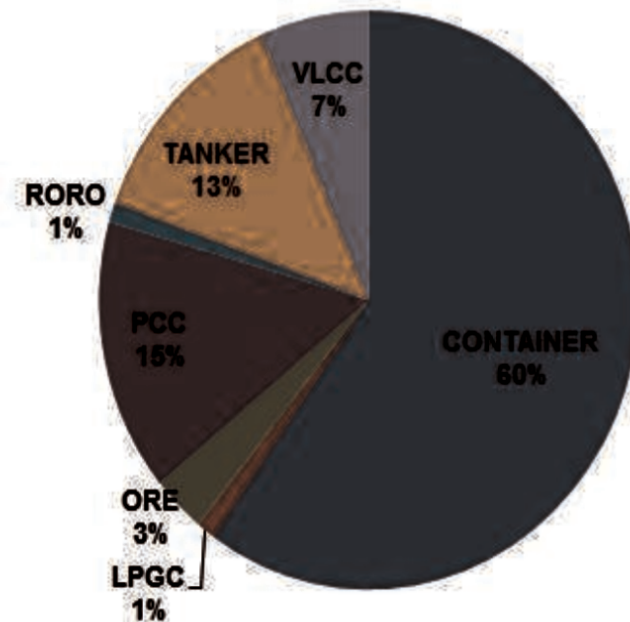
caused by hub vortex

- ✓ The pressure in the center of hub vortex is low and it occurs the power which pulls ship back, which means the thrust of the propeller is reduced.
- ✓ HVFC have some grooves and they increase the core radius of hub vortex, as the result, HVFC reduce falls of the pressure.

**1-3% Propulsive Efficiency
Improvement !**

HVFC Record

- MHI-MME manufactured about 150 HVFC since 1989 for new building vessel, and also for retrofitting
- Expect the improvement for all kinds of vessel
- No bad influence to the propulsive performance
- Decrease rudder erosion by the hub vortex cavitations



Please provide MHI-MME the **original propeller drawing (including the pitch value of blade root)** to design HVFC.