



# EEDI friendly 82K Bulk Carriers R&D



2012.11.22



## MAIN TOPICS

- New generation design of 82K BC
- Design improvements
- Remained issue
- Future design concept
- Conclusion



## New generation design of 82K BC

- DFOC **26.7** t/d
- Attained EEDI value: 3.493 g/ton.nm
- Required EEDI: 4.367 g/ton.nm

**20%**





# New generation design of 82K BC

SN	Main Particulars	New Design(II)	New Design(I)	Mother Ship
1	Loa (m)	229.00	229.00	229.00
2	Lpp (m)	225.50	225.50	222.00
3	B (m)	32.26	32.26	32.26
4	D (m)	20.05	20.05	20.25
5	Ts (m)	14.45	14.45	14.62
6	DWTs (tons)	81600	82000	79600
7	ME type	6S60ME-C8.2-TII	5S60ME-C8.2-TII	7S50MC-C
8	MCR (kW)	13560×105	11900×105	11060×127
9	CMCR (kW)	9930×91.5	9800×98.4	-
10	CSR (kW)	7110×81.9	8330×93.2	9401×120.3
11	DFOC at CSR	26.7	32.5	37.8
12	Vs (kn)	13.63	13.8	14.0
13	Aux. Power(kW)	550	550	700



## New generation design of 82K BC

- Attained EEDI value
  - Mother ship: 4.353 g/ton.nm
  - New Design: 3.493 g/ton.nm
- DFOC reduction: abt. 11 t/d
- EEDI reduction: abt. 20%



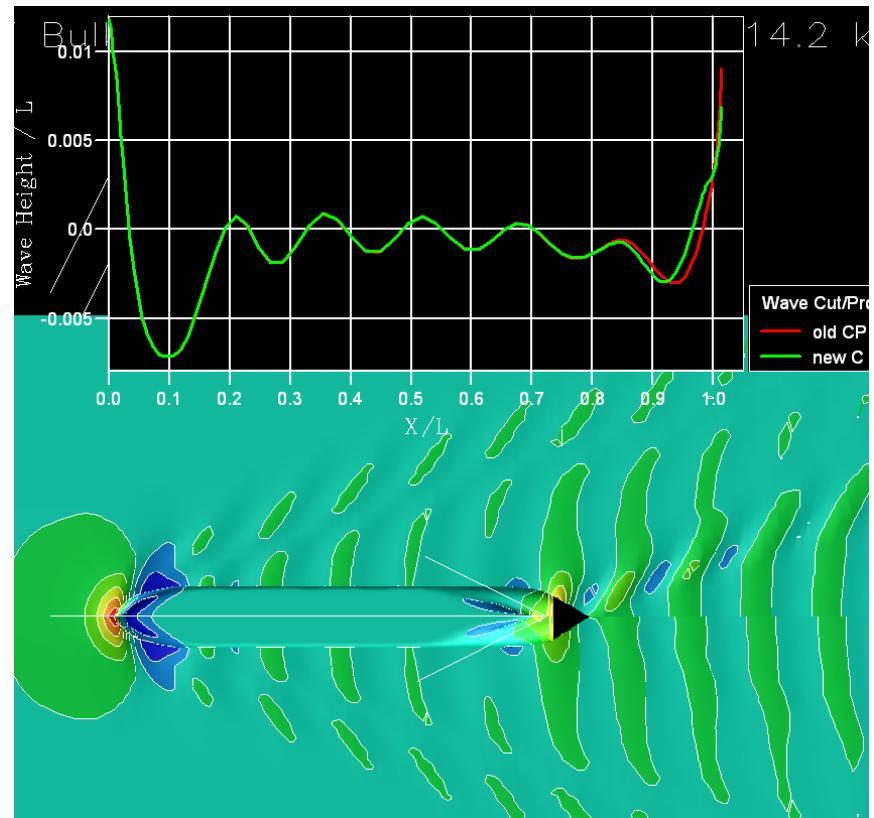
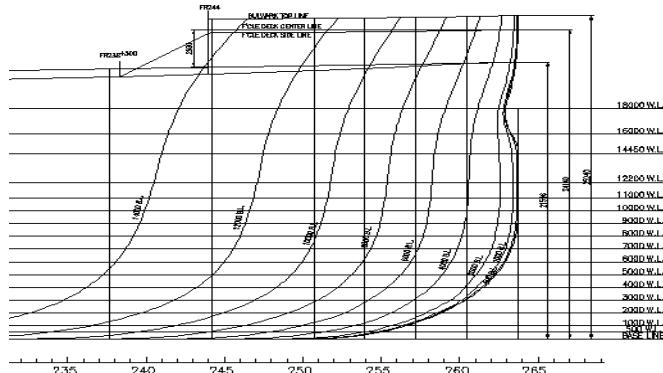
## Design Improvements

- Hull Optimization
- Main Engine selection and load tuning
- Propeller design
- Energy saving device
- Lightship weight control
- Vibration free
- Optimized subdivision



# Design Improvements

- Hull Optimization



## Design Improvements

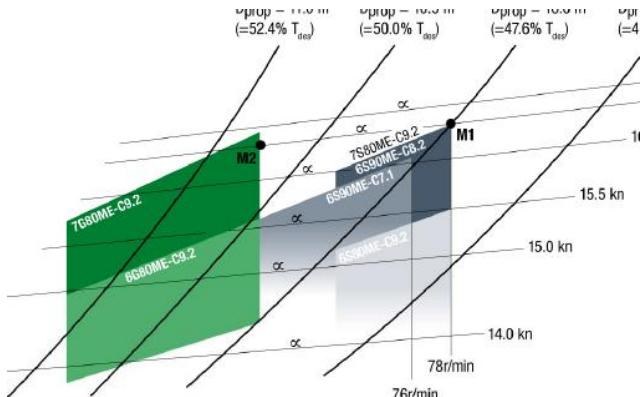
- Main Engine selection and load tuning

Different engine maker: MAN, Warstila and Mitsu.

Different cylinder numbers: 5 or 6

Different engine type: C7, C8.1, C8.2, B8.1, G or X

Different load tuning: standard, part or low load





## Design Improvements

- Propeller design

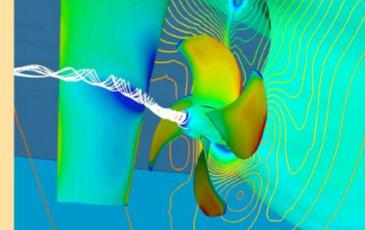
- Different diameter, blades

- High efficient propeller design

0.75

**B1**

Optimized propeller efficiency



- Computer optimizes propeller, with hull and rudder interaction

**Cost** (5 years) 

**Gains**



## Design Improvements

- Energy saving device

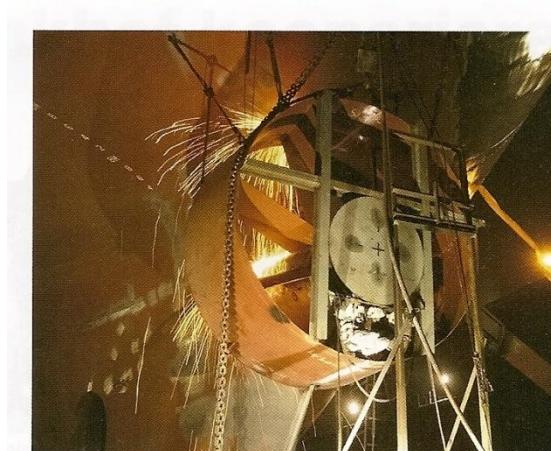
Wake equalizing duct

Propeller boss bulb

Mewis Duct

Propeller boss cup fin

0.78



Eine Nachrüstung mit Mewis Duct® ist innerhalb weniger Tage möglich



## Remained issue

- Low Exhaust gas temperature and steam production

< 200 deg.C

< 600kg/h



## Remained issue

- Main Engine SFC margin

+5%

Attained EEDI close to  
Border



## Remained issue

- Minimum Power Requirement

Exemption Line Value = a ′ (DWT) + b					
DWT	Power	Reference line value	SFC	Attained EEDI Value	Reduction rate
82000	9164.4	4.357035011	162	3.483	0.2



## Remained issue

- Further reduction of EEDI value

How to reach 30%  
reduction ?



## Future Design Concept

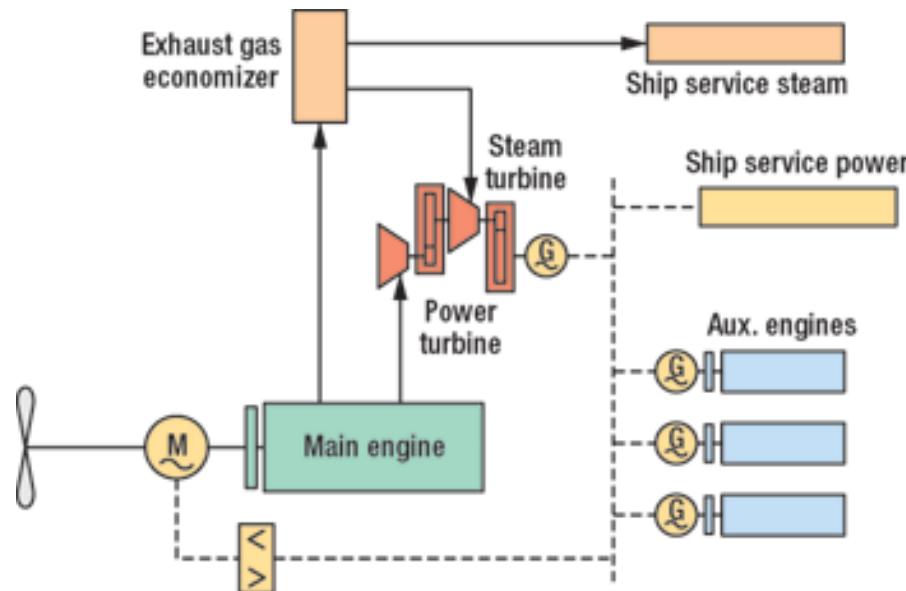
- LNG as fuel

- CO<sub>2</sub> emissions reduction= 20%
- NOx emissions reduction=90%
- SOx emissions reduction= 100%



# Future Design Concept

- Waste heat recovery





## Future Design Concept

- Low friction technology

A2 3

**Low-friction coating**



- Reduces frictional resistance via "slick" surface

**Cost** (5 years) € € €

**Gains**



## Future Design Concept

- Wave added resistance reduction in rough sea.



## Future Design Concept

- Wave added resistance reduction in rough sea.
- SEEMP



## Conclusion

It's hard to reach the target of phase 3 if only current energy efficient technology available.  
Ship design is becoming more and more difficult.



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**THANKS FOR YOUR ATTENTION !**