



Efficient Bulk Carrier Designs — Setting the Bar

Combining cost-efficiency with sustainability



Makes the difference



Contents of the presentation

- > Starting from Scratch
- > Tough Performance Goals
- > Cooperation is the Key
- > The Results



Starting from Scratch

Deltamarin, a company with a reputation





Taking on the work horse of the seas





Tough Performance Goals



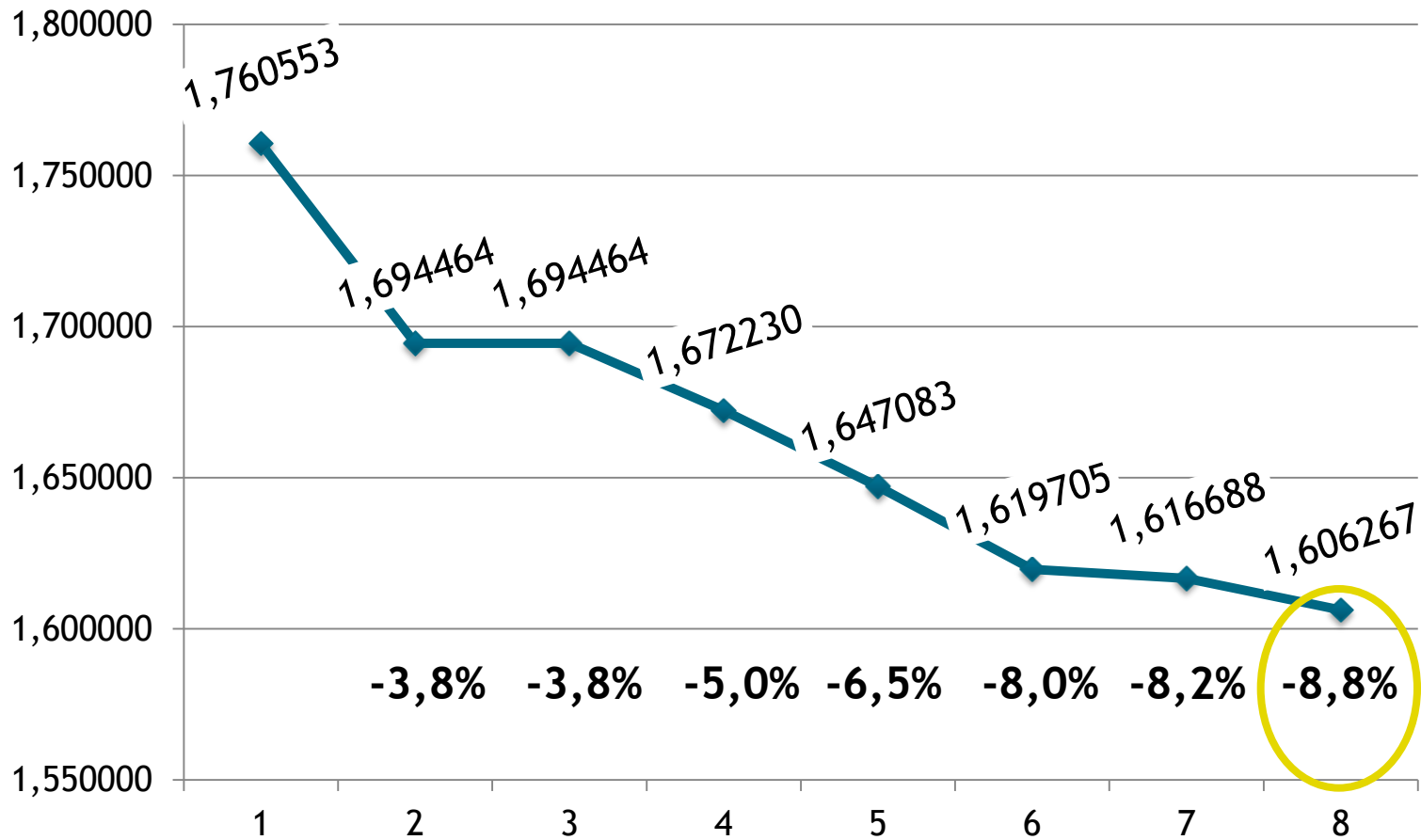
Key Performance Indicator KPI

- > Value (or values) that express the performance of the ship
 - Defined in the beginning of the project
- > For example ”consumed fuel / performed transport task”

$$\frac{g_{fuel}}{t * nm}$$



Total Annual Average KPI





Cooperation is the Key

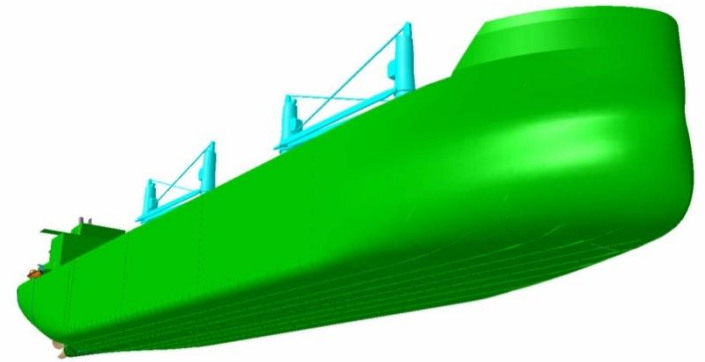


Customers, the most important partners...

- > BRS
- > HSVA
- > Engine makers
- > Customers



B.Delta development



- > No tricks, only state of the art Naval Architecture
- > No single contributor: effort carried out across the spectrum of naval architecture;
 - (1) hull form
 - (2) propeller
 - (3) rudder
 - (4) main engine
- > Large series of model tests carried out.
- > Two Panamax size vessels already delivered to the specified performance.



Hull form

Saving in Propulsion Power via efficient hull form

> New Efficient Bow Shape

- Low bow wave
- Low viscous pressure resistance, reduced dynamic sinkage and trim
- Low forward shoulder wave

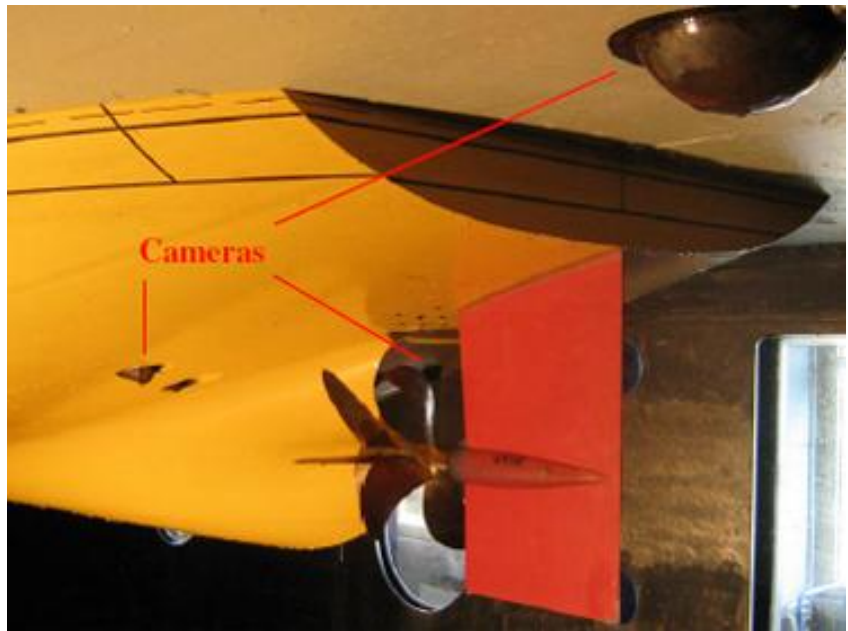


> Improved Aftship Shape

- Smooth transition from flat bottom and sides to buttocks
- Reduced shoulder wave
- Reduced viscous pressure resistance

Propeller

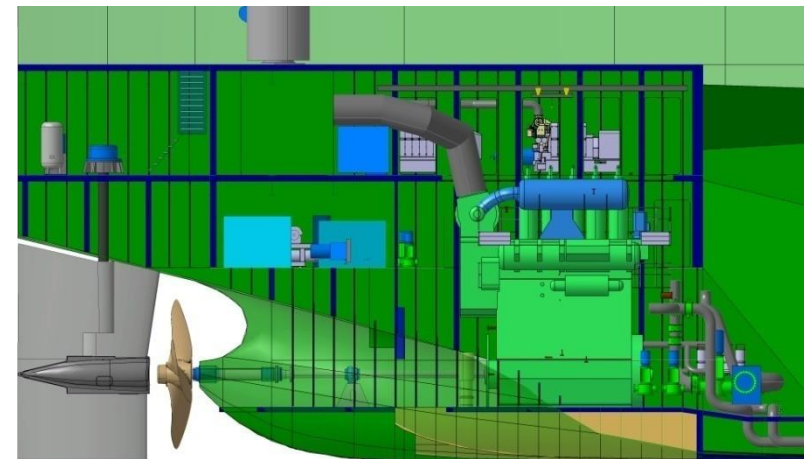
- > Extremely good and even wake field
- > Larger propeller diameter and lower rpm possible
- > Two pre-swirl stators
- > Two competitive propeller designs for final propeller
- > High propulsion efficiency achieved; 0.808 instead of typical 0.70 to 0.75 at the best





Rudder and Manoeuvrability

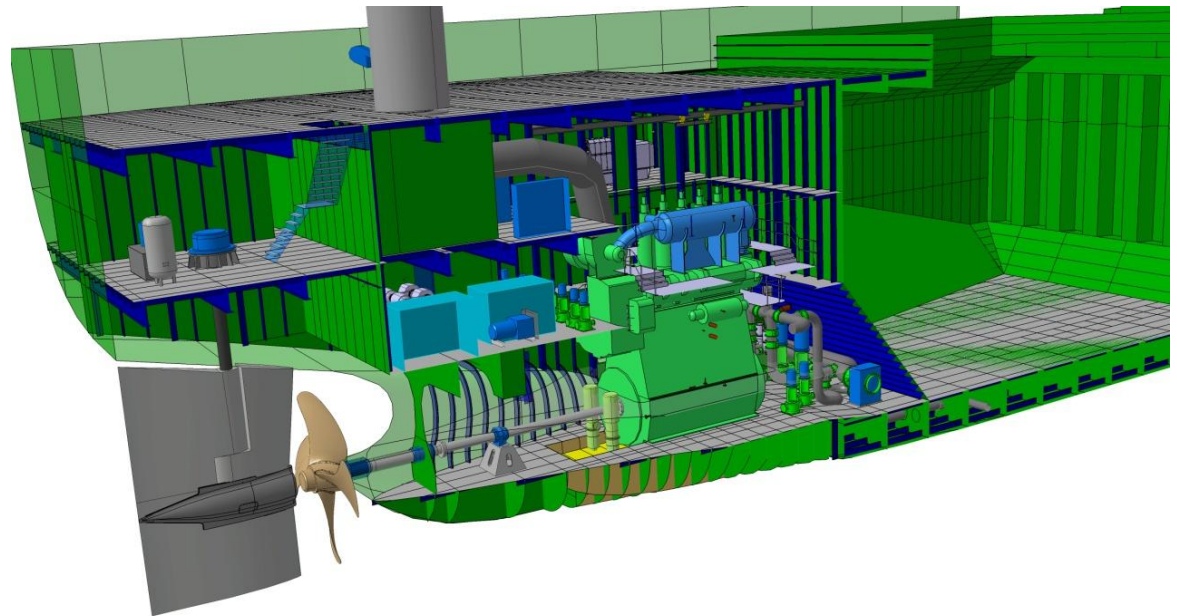
- > Tailored profile, based on NACA 6-series profiles
- > Rudder bulb with hub cap to improve efficiency
- > Large area for better manoeuvrability and directional stability
 - Important at sea for fuel efficiency in head and quartering seas and winds
- > Very slender profile to enhance propulsive efficiency
- > Structure meets CSR requirements
- > Rudder angle up to 70 degr. to improve harbour manoeuvrability
 - Extremely important for safe navigation under economical speed and shallow port entrances





Main engine

- > De-rated main engine
- > Design point L4 in the engine layout diagram allowing low rpm for propeller
- > Lower SFOC





The Results



Main features of the design

- > Compact and shallow draft ship
- > High deadweight (higher block coefficient than typical) and high cargo cubic
- > High degree of manoeuvrability and course stability, compliance with latest IMO recommendations
- > Unique power / speed performance and very low fuel oil consumption, including operation in heavy seas
- > Efficient use of potential and RANS code Computer Fluid Dynamics (CFD) tools



B.Delta37 vs. competition in 2009

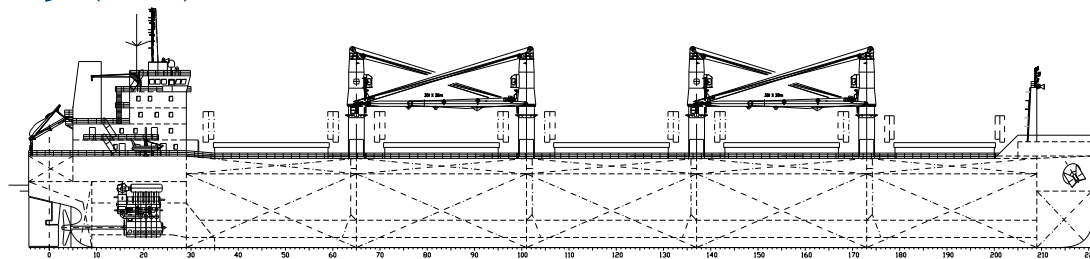
Scantling deadweight	Daily fuel oil consumption main engine 10,200 kcal/kg	Design Deadweight Draft	Service Speed	Loa Beam Depth	Cargo Cubic
40,000 / 10.5	18	35,000 / 9.5	14.0	180 / 30 / 15	50,000
33,000 / 10.2	24.8	30,000 / 9.5	14.2	177.5 / 28.2 / 14.2	42,500
35,000 / 10.15	25.2	35,000 / 10.15	14.0	180 / 30 / 14.7	47,500
37,000 / 10.40	25.2	35,300 / 10	14.0	189.9 / 28.5 / 15.1	47,500
34,000 / 9.80	31.68	32,000 / 9.40	14.6	181 / 30 / 14.6	47,000
34,770 / 9.00	27.2	30,000 / 9.00	14.0	180 / 30 / 14.7	47,000
36,500 / 10.9	27.9	31,500 / 9.8	14.8	187 / 27.8 / 15.6	47,600
37,000 / 10.62	28.8	37,000 / 10.62	14.0	179.9 / 30 / 15.2	47,000
37,300 / 10.55	22.6	35,000 / 10.00	14.0	180 / 29.8 / 15	47,000
37,000 / 10.85	28.8	33,100 / 10.00	14.7	177.8 / 28.6 / 15	45,600
38,000 / 10.00	25.2	35,700 / 9.55	14.3	184.9 / 30.6	46,900



B.Delta - the first “Eco-ship”

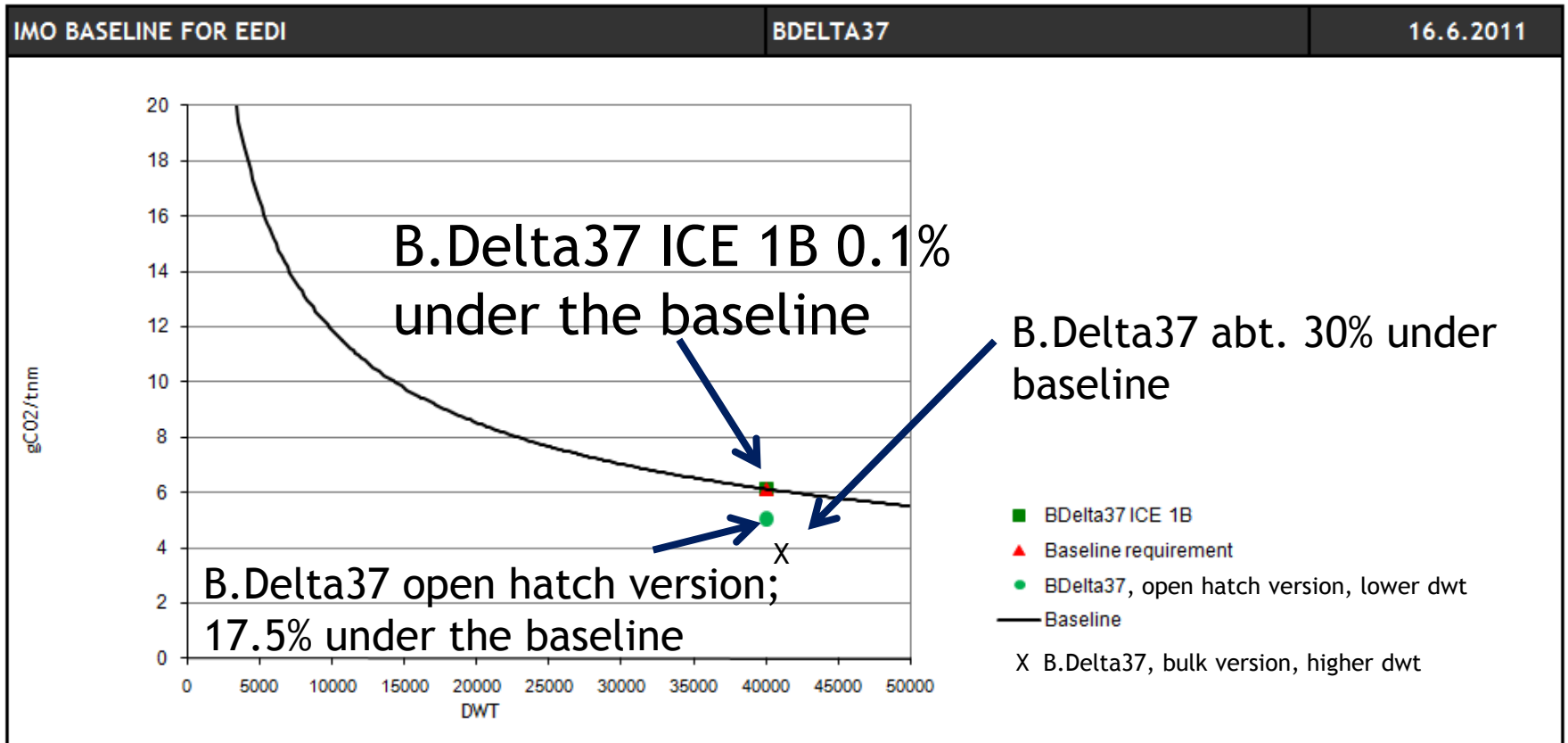
Handysize B.Delta37, 40,000 tdw

- > Length overall 179.99 m
- > Breadth 30.00 m
- > Draught (design) 9.50 m
- > Service speed 14.0 kn
- > Cargo cubic 50,000 m³
- > Daily fuel oil consumption **17.6 tonnes/day (ISO)**



B.Delta37

B.Delta37 EEDI Estimates Based on Model Tests



EEDI baselines according to MEPC 62/6/4

Thank you,
for further information please contact:
paivi.haikkola@deltamarin.com

