Offen Bulkers

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Fuel Saving on Bulk Carriers

By

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- **Scorpio Ship Management s.a.m is the technical arm of Scorpio Group**
- **200 Nbs ordered from 2011; tankers, bulkers, gas carriers, containers**
- **75 bulkers ordered ranging from Ultramax through Kamsarmax up to Capes**
- **All NB vessels have enhanced fuel efficiency design/features**

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Ship opportunities: Eco Ship

➡ Fuel Efficiency

- Hull form
- Propeller
- Main engine
- Hull roughness
- Fuel efficiency devices

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- Reconsideration of main dimensions and service profile
- Service speed, block coefficient, bulbous bow
- LCB position/form factor, wave resistance, wake fraction

Hull form

Rw/Rt % decreases → entrance angle increases, bow volume increases, Lcb moves forward, lower friction resistance, better wake field aft

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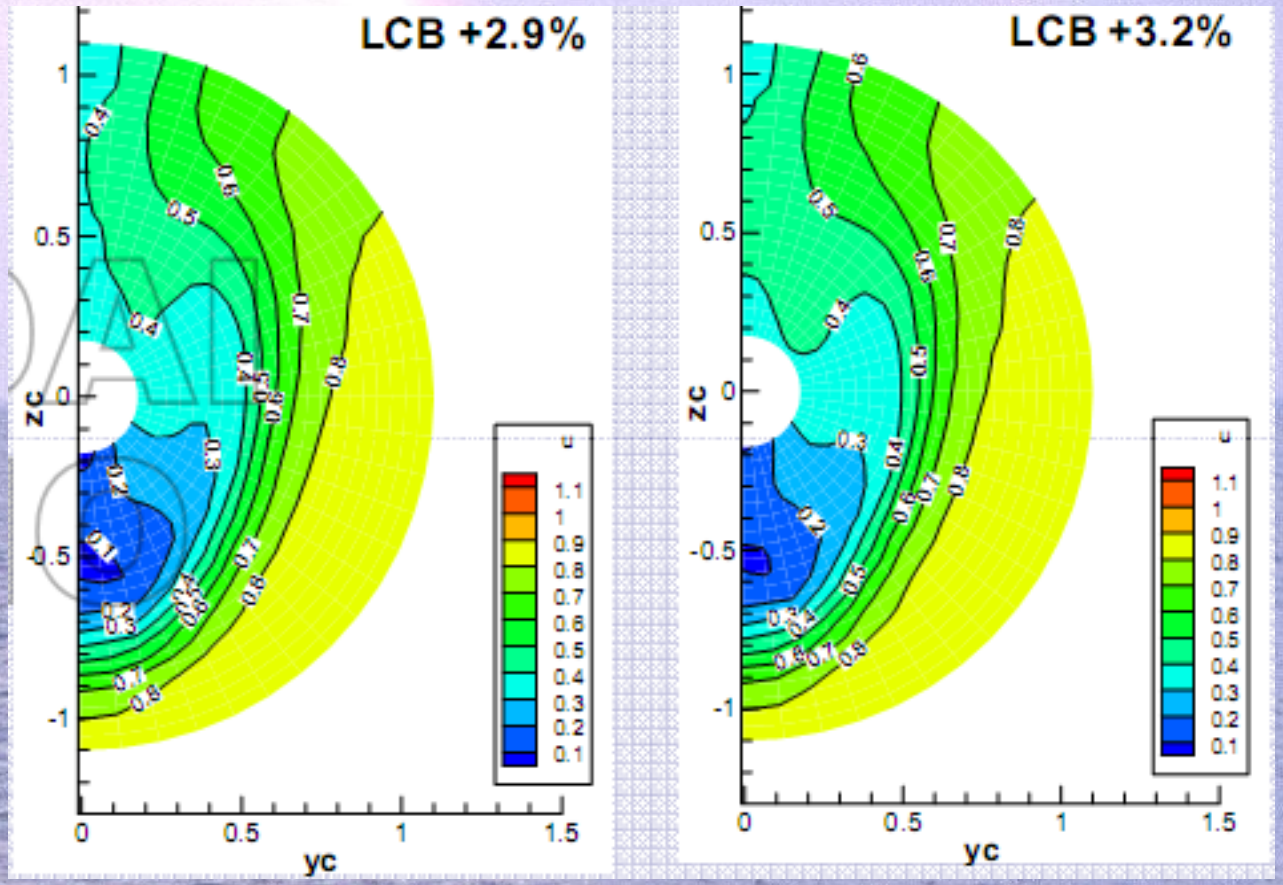
Hull form

Lower and stable wake fraction positively influences propeller efficiency and reduce noise and vibration



$$Va = Vs \times (1-w)$$

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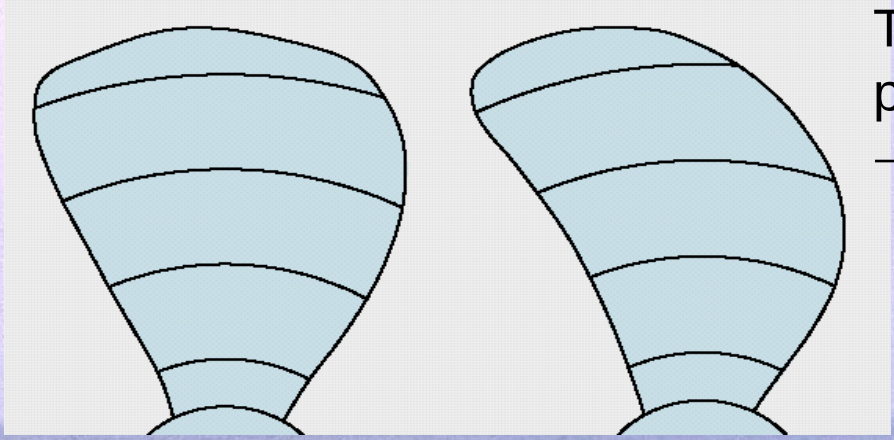
Ship opportunities: Eco Ship

➡ Fuel Efficiency

- Hull form
- **Propeller**
- Main engine
- Hull roughness
- Fuel efficiency devices

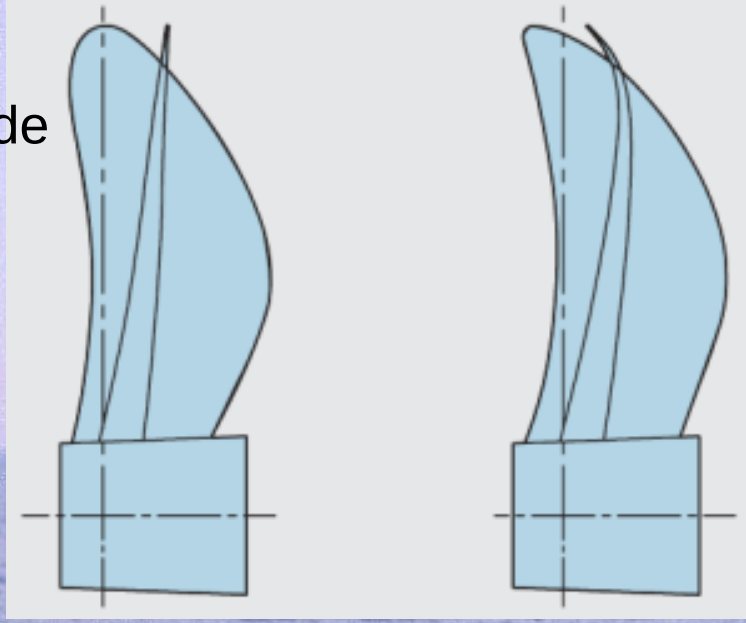
- Higher diameter→ higher efficiency
- Ae/Ao, improved cavitation design moving out from standard wing profiles
- Tip rake or winglet for limiting the tip vortex effect
- Modification of radial pitch/area distribution (skew, 3 blades)

Propeller



Better distribution of areas where ↑ efficiency increases

Tip rake on pressure side →



Wing profile fine tuned for improved ← cavitation

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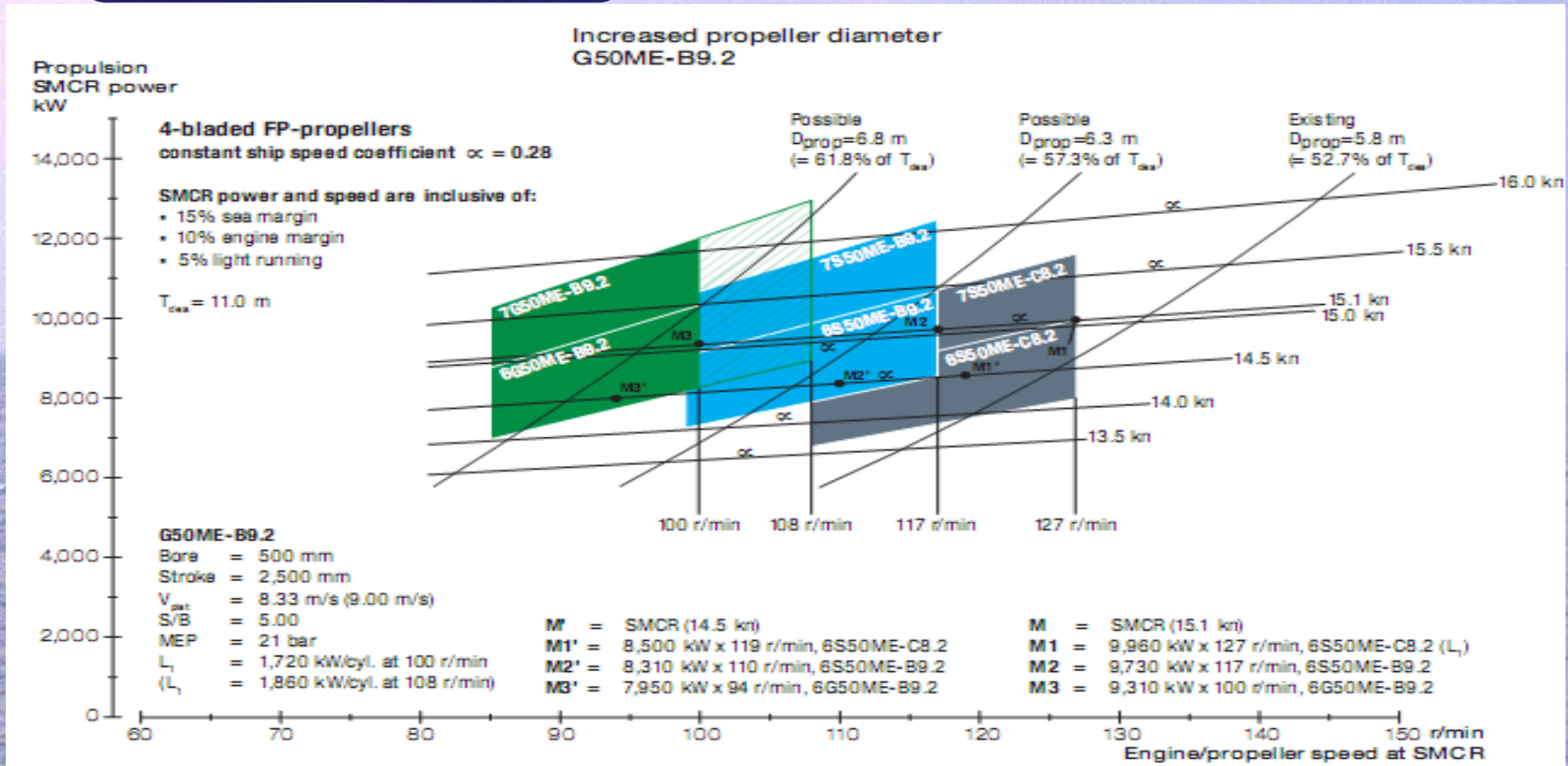
Propeller

Moving along constant ship speed curve toward lower revs/higher propeller D, power req. decreases due to overall higher efficiency of the propulsion system



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Ship opportunities: Eco Ship

➡ Fuel Efficiency

- Hull form
- Propeller
- **Main engine**
- Hull roughness
- Fuel efficiency devices

- Balance between lower SFOC and lower revs
- Electronic control (injection timing and injection profile)
- Engine tuning (ECT, EGB, VTA) and type (gas engine/scrubber) depending by service profile and percentage in ECA
- Super long stroke for better coupling with high dia propellers
- Challenges: matching of new propeller curve with engine load diagram

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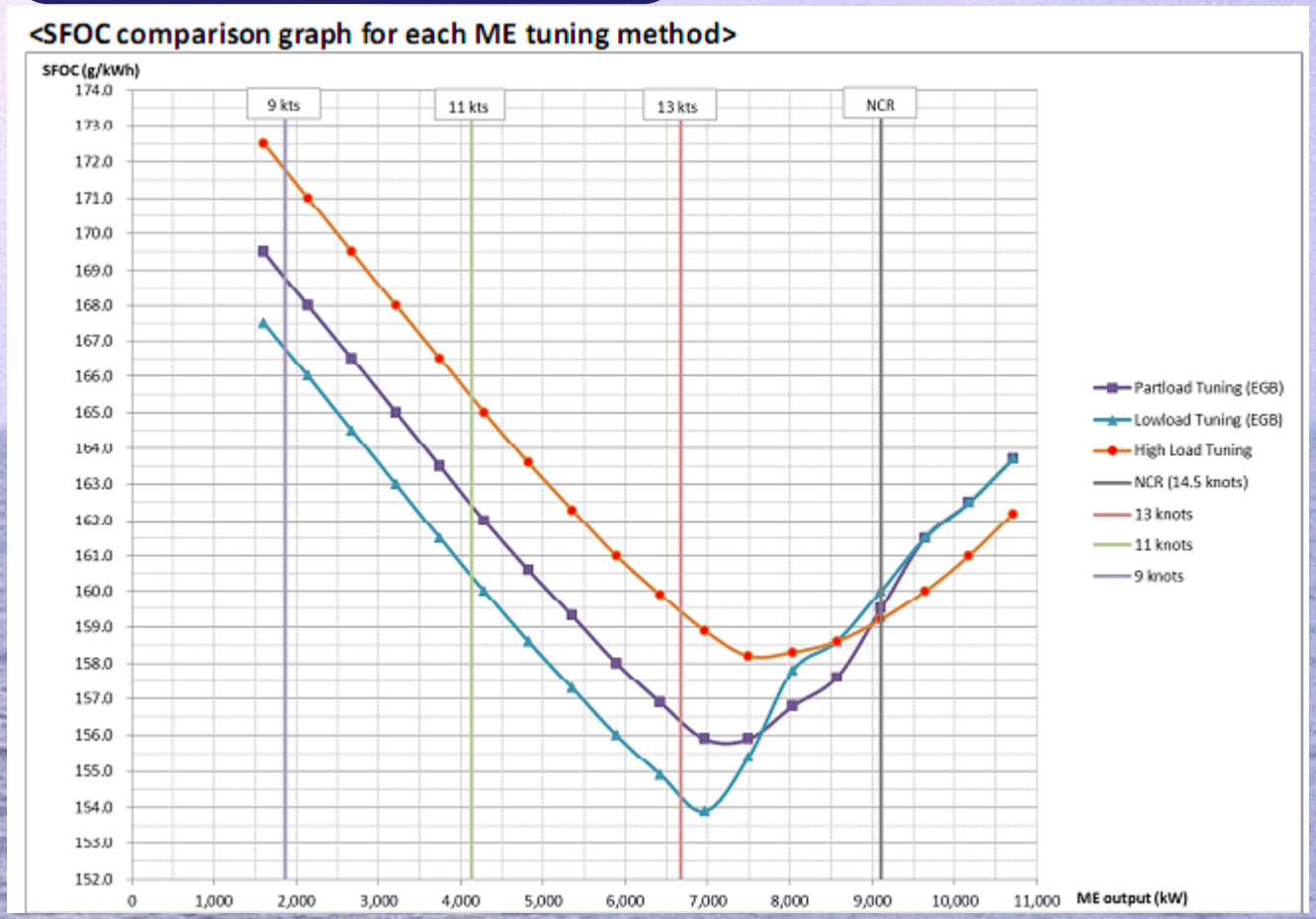
Main Engine

Selection of proper engine tuning basis service profile including percentage in ballast as opposed to laden might improve SFOC by 5 g*kW/hr (3%)



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Ship opportunities: Eco Ship

➡ Fuel Efficiency

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- Main engine
- **Hull roughness**
- Fuel efficiency devices

- Silyl acrylate, Biocide free, Low friction post silyl acrylate
- Friction resistance account for 65% of total resistance for large low speed tankers/bulkers
- Target reduction of hull roughness to below 50 microns and the maintenance of it through the 5 years service life

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Ship opportunities: Eco Ship

➡ Fuel Efficiency

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- Propeller
- Main engine
- Hull roughness
- Fuel efficiency devices

- Duct (Mewis or other) to ameliorate wake field
- Pre/post swirl device (fins, PCBF, twisted rudder) to recover rotational energy
- Full spade rudder to reduce hull resistance
- Rudder bulb to reduce losses due to propeller cap vortex

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Ship opportunities: Eco Ship

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- Frequency controlled electric consumers
- Waste energy recovery (economizer for DDGG)
- Electric fuel/oil heater

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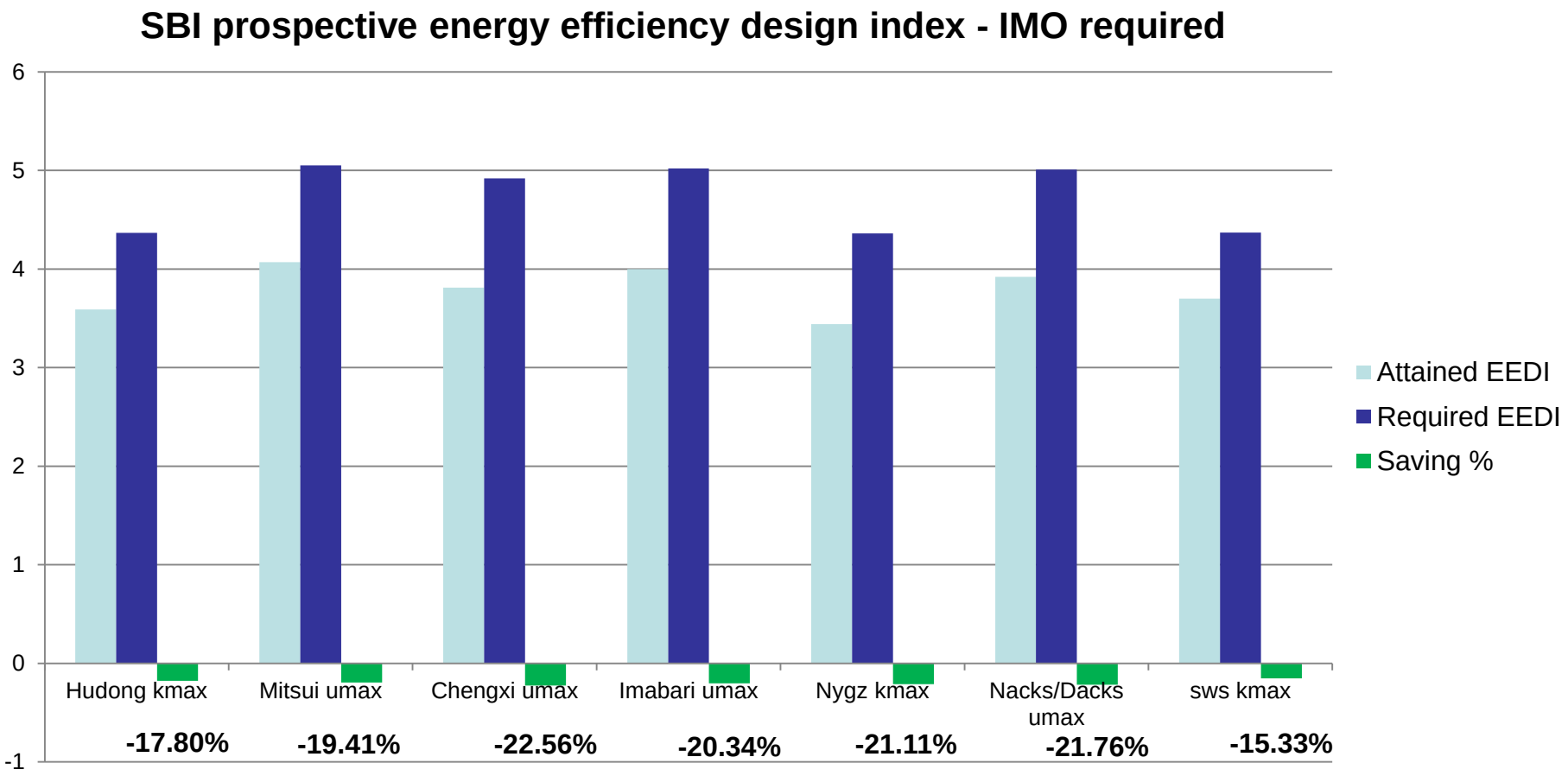
Overall Results and Conclusions: EEDI

Efficiency of Transportation

CO2 Emission Reduction



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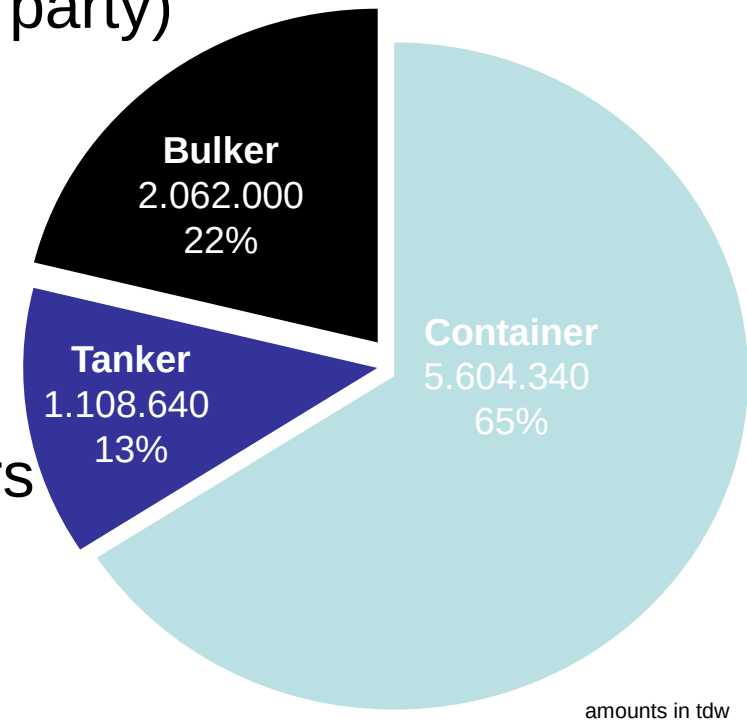
Offen Group

Offen Group is one of the leading ship managers/ owners and providers of shipping services worldwide

Manager of 111 vessels (own & third party)

- 73 containerships (450,000 TEU)
- 26 product tankers
- 11 capesize bulkers, 1 Kamsarmax
- Overall 8.7 Mio. tdw.
- Average age of all vessels: 6.7 years
- Existing charter contracts until 2027
- Contracted Charter over USD 4 bn



amounts in tdw

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Offen Tankers/ Bulkers are dynamic growing, first class shipmanagers

26 tankers

- 16 Handymax (8 Scorpio)
- 10 MR (2 Scorpio)

Overall **1,108,600 tdw**

Average age : **3.8 years**

12 bulkers

11 Capaesize (7 Scorpio)

1 Kamsarmax (1 Scorpio)

Overall **2.062.000 tdw**

Average age : **1.9 years**


Work Safety
Wages
Working Hours
Carbon Footprint
NOx, CO_2, SOx Emissions
EEOI
Tier III
SEEMP
Environmental issues
ECAs

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Energy saving – What to do?

- Identify Potentials
- Smart Data Collection
- Link to existing Data
- New Hardware, like Flowmeters
- Data Transmission, Software
- KPIs
- Crew Training

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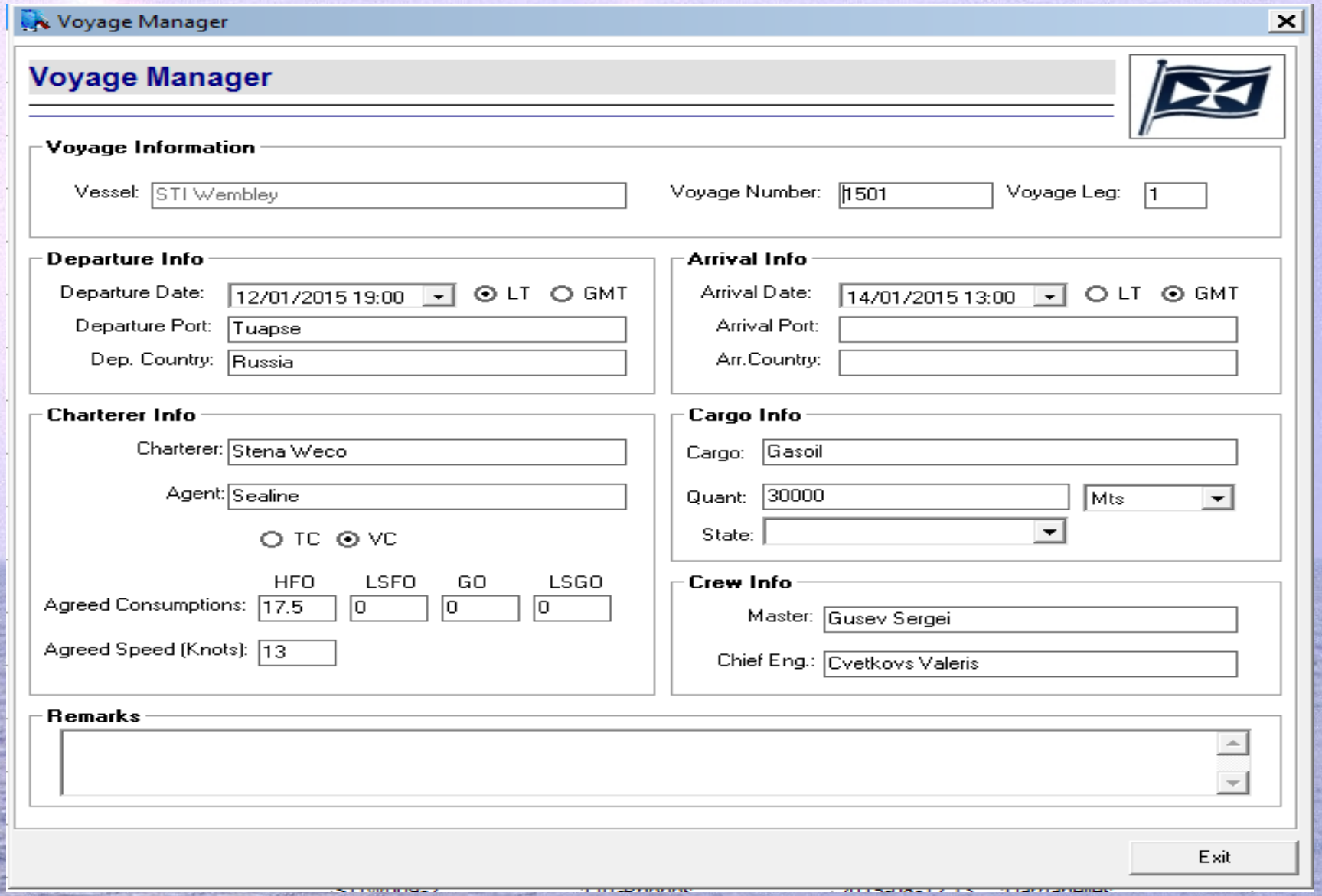

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