

Competitive Edge through Environmental Performance

Maersk Maritime Technology

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MAERSK
MARITIME TECHNOLOGY

Maersk Maritime Technology

Maersk Maritime Technology (MMT) is a **highly specialised** ship technology **knowledge and competence centre** within the Maersk group.

-MMT provides **specialised technical services** to more than **350 different vessels**, in particular **Maersk Line, Maersk Tankers and Maersk Supply Service**.

-We serve **ships in operation** as well as **ship repair projects** and **newbuilding projects**.

- MMT has **coordinated and supervised** more than **400 newbuilding projects** for **various ship types**.

- MMT staff have very **strong experience in ECO efficiency, performance monitoring and innovation** in ship technology.





Main Environmental Issues for Shipping

Air Emissions and Fuel

- *Green House Gasses, NOx and Sox, Particulate Matters, VOC, etc.*

Discharges to sea

- *Accidental discharges, Ballast water, Antifouling/Coatings, Oily water, etc.*

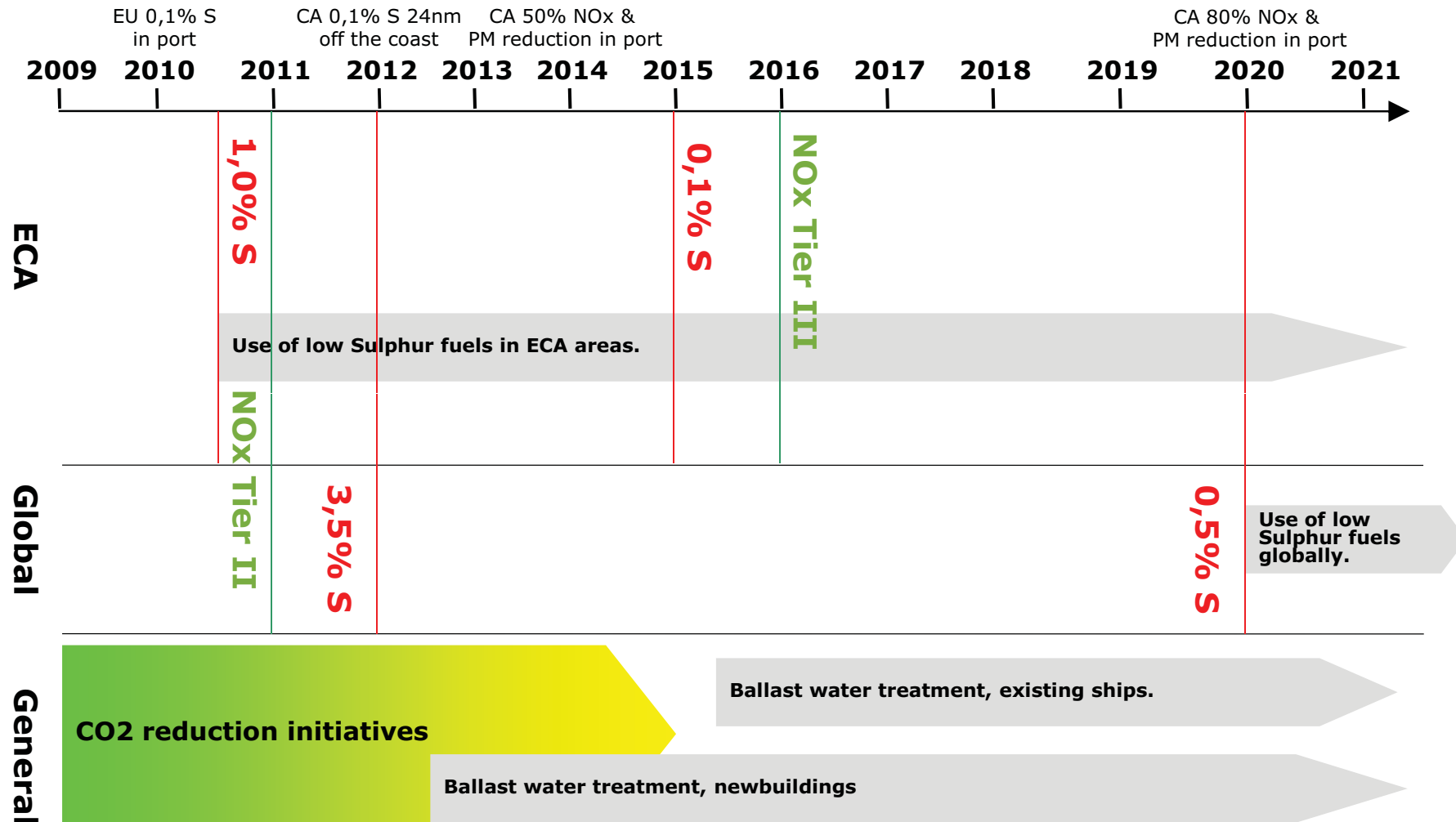
Recycling

- *Hazardous materials, Working conditions, etc.*

Waste

- *Waste handling & management, Incineration, etc.*

Regulatory scene



Maersk Innovation Projects

Energy Efficiency

CLT Propeller, Auto tuning Pmax for main engines, Turbocharger with variable turbine geometry, Energy efficient ventilators, Pump and cooling system optimization, Drag reduction, Operational guidance, ...

Environment

Ballast Water Treatment, EGR – Exhaust Gas Recirculation, Water hydraulics for remotely operated valves, 2nd stage purification (treatment of sludge), Fuel separator comparison, PM Filter for Aux. engines, Lub oil reduction, ...

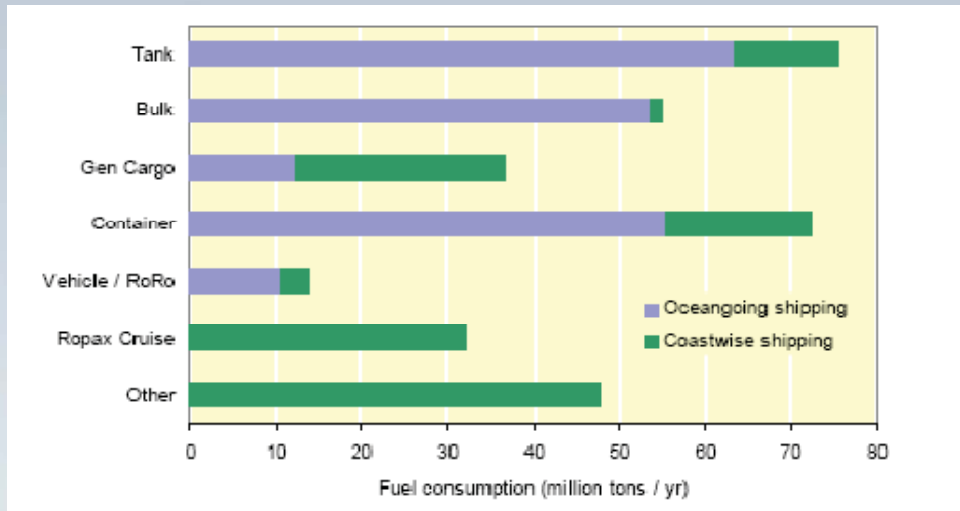
Safety

Lifeboat project, Pendulation control for supply vessels, Stability warning system on anchor handling vessels, ...



Second IMO GHG Study 2009

-Fuel consumption per ship type and contribution to international shipping emissions per ship type

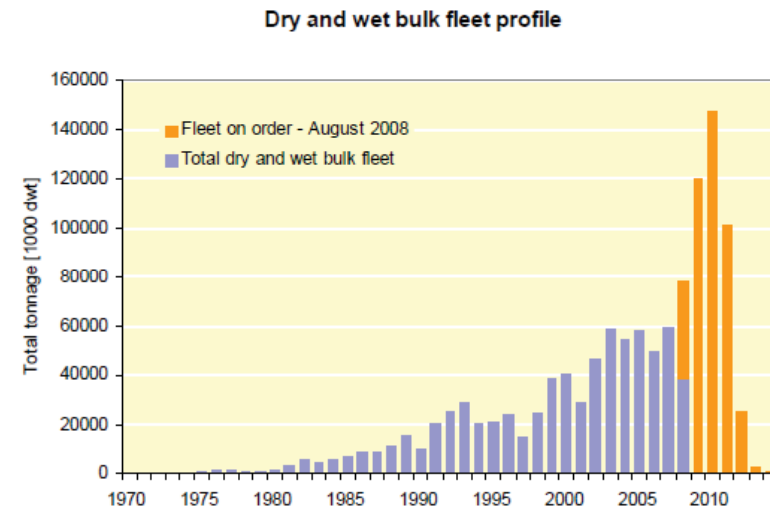
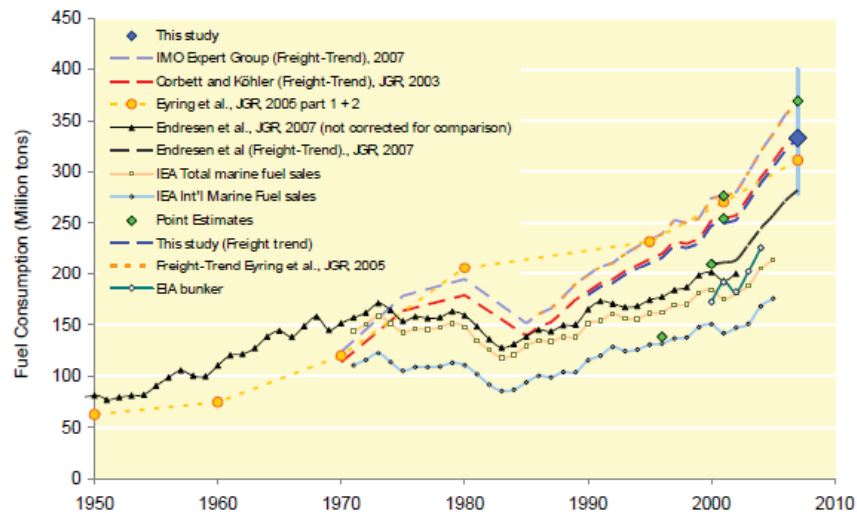


Contribution to international shipping emissions

- Tank 32%
- Container 28% ←
- Bulk 27%

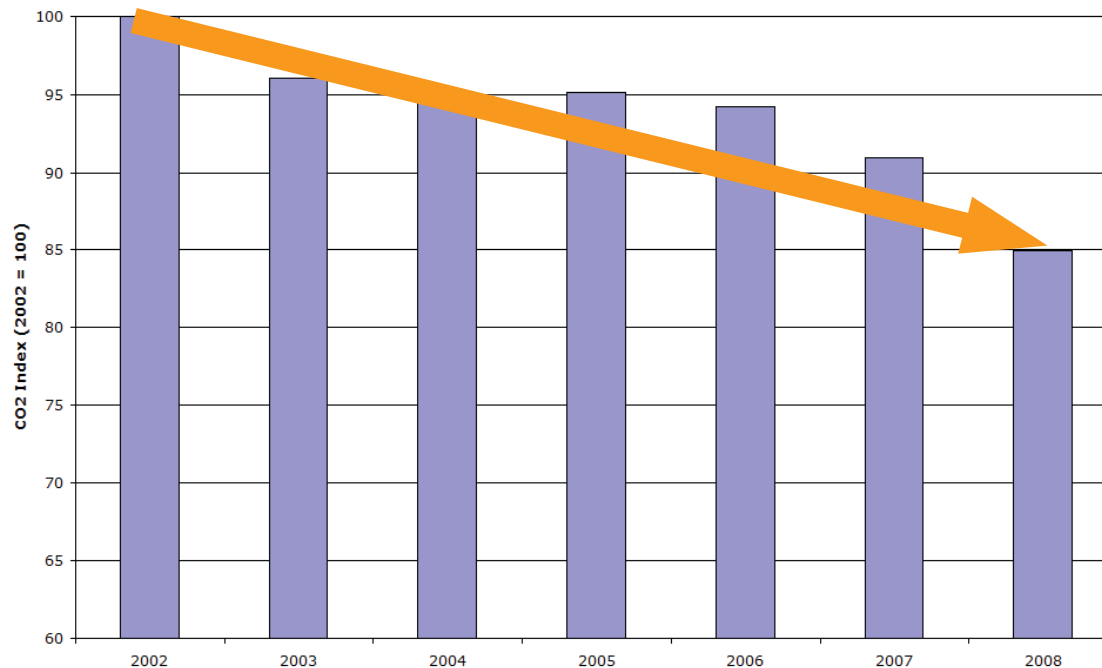


Can increasing fuel efficiency break the curve of increasing CO2 emissions?



Source: 'Prevention of air pollution from ships, second IMO GHG study' MEPC 59/INF10, 2009

Achievements and targets ...

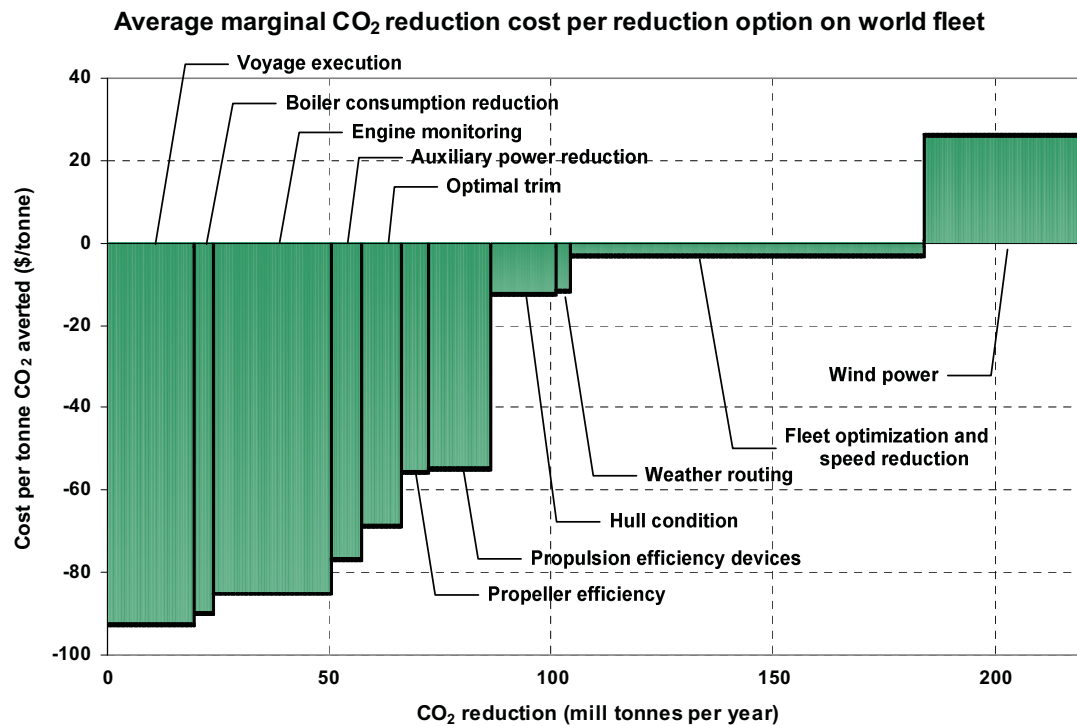


Maersk Line has reduced CO2 emission of own fleet with 15% in the period 2002 to 2008

Relative targets:

- **Maersk Line**
25% reduction per TEU-km from 2007 to 2020
- **Maersk Tankers**
15% reduction per tonne-km from 2007 to 2015
- **Maersk Supply Service**
5% reduction by end 2011

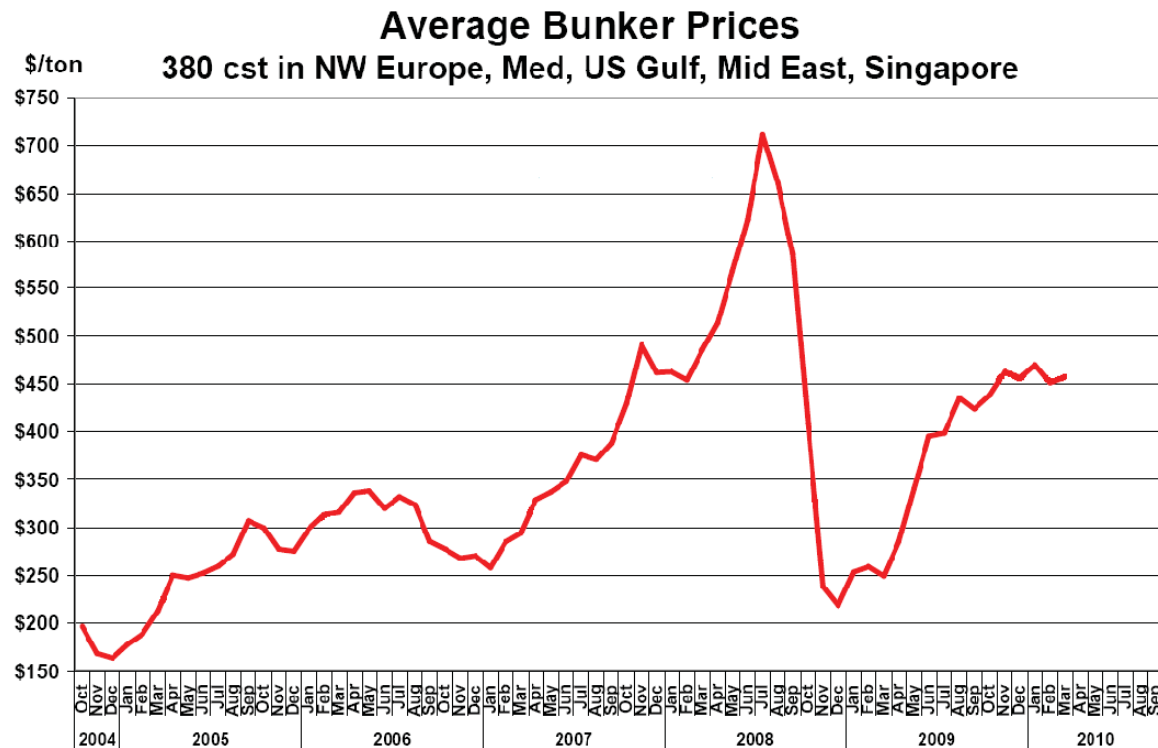
Improving energy efficiency is generally good business to some extent



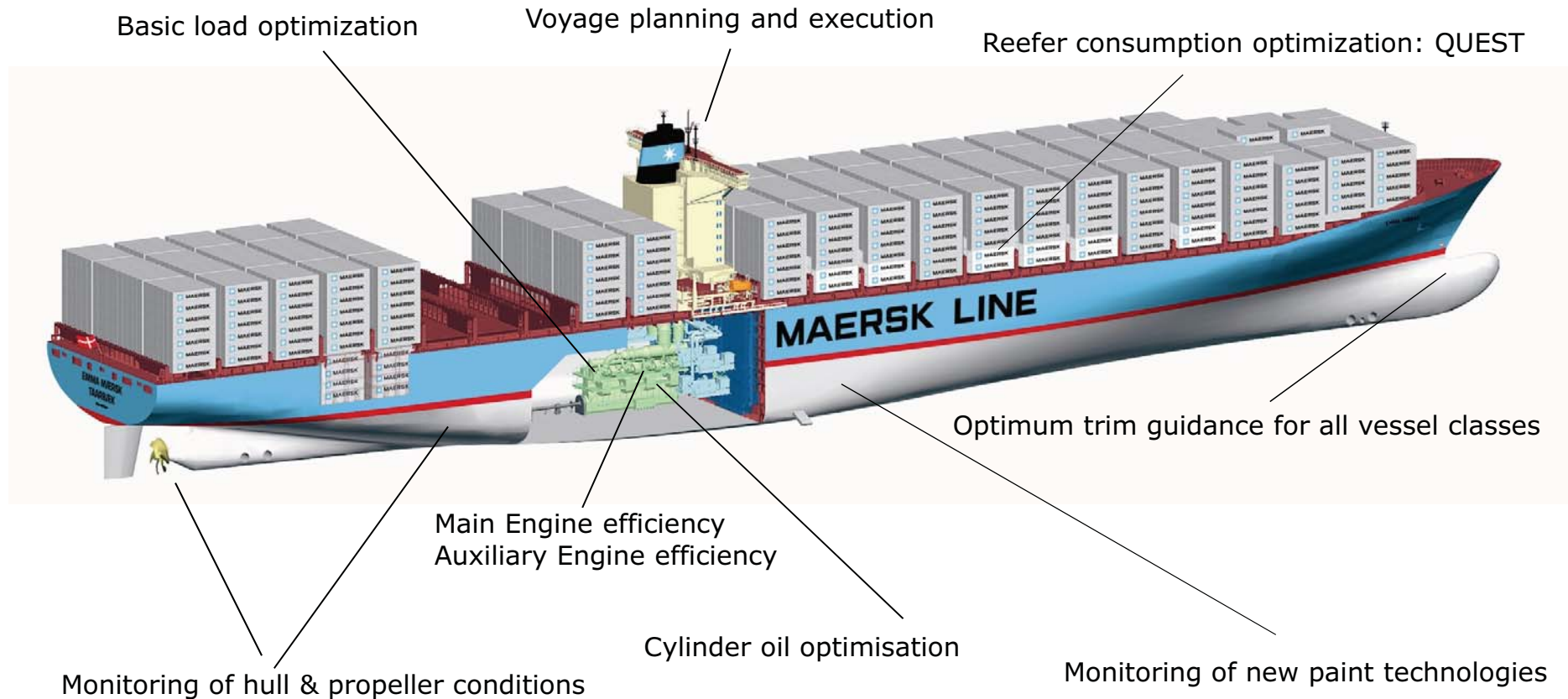
Source: Det Norske Veritas



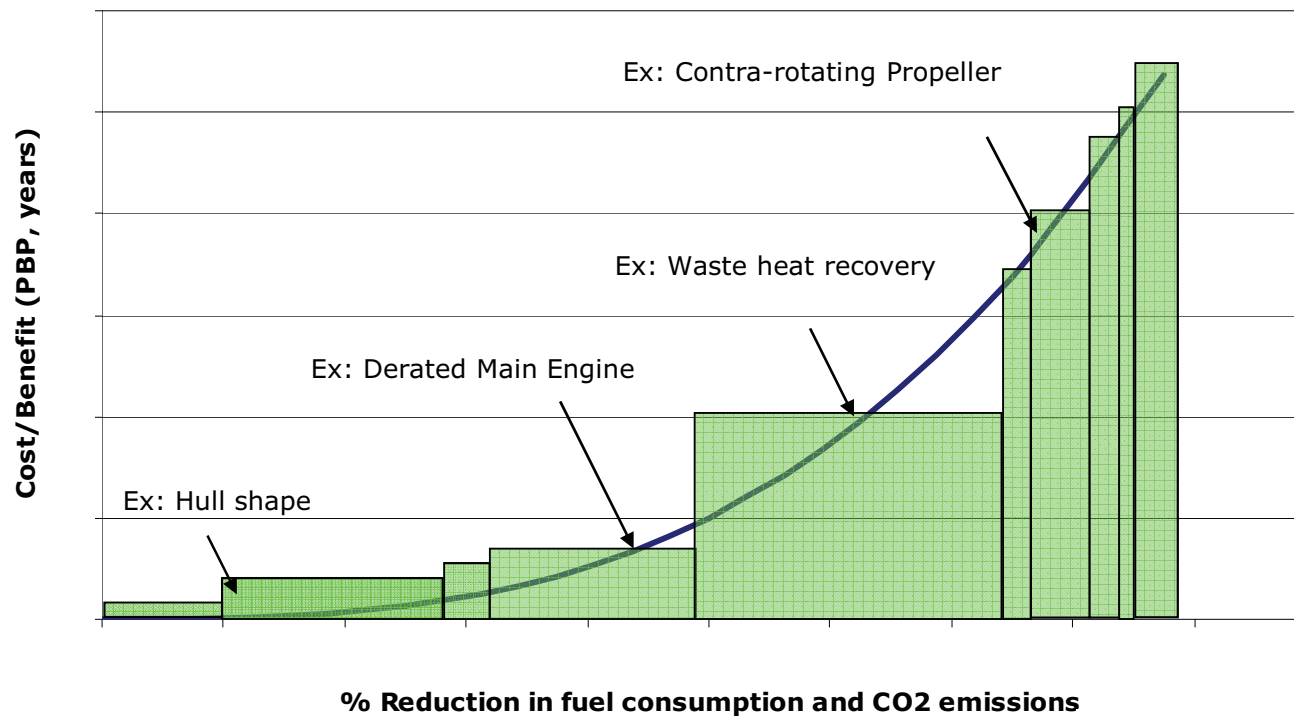
Fuel cost is a main driver of improvements but a very uncertain parameter.



Energy Efficiency. Innovating with suppliers. Analyze, plan and implement with regard to: Size, speed, technologies, management.



A systematic cost-benefit approach to technology investments

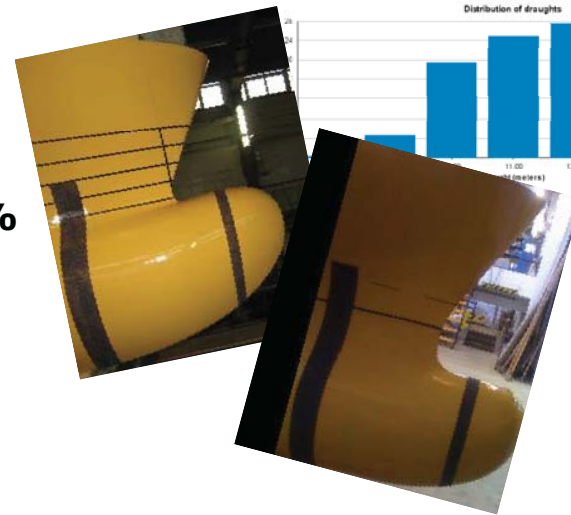
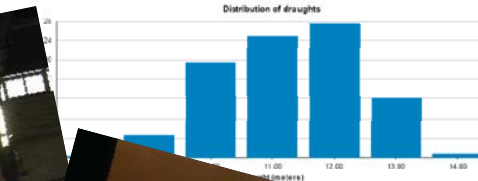
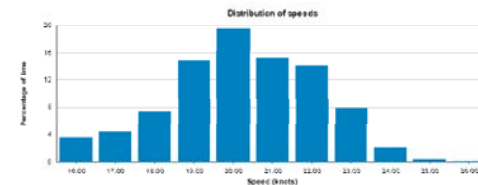




Optimized Maersk Containership

Based on detailed design and optimization of a new containership design for Maersk Line, significant improvements to a standard design were made:

- Super long stroke engine: 3%
- Increased propeller diameter: 5%
- WHR and direct intake for TC: 9%
- Hull form optimization: 8%
- **Total reduction: app. 22%**



Savings per year per vessel:

Fuel : 8650 tonnes

CO2: 25,950 tonnes

Source: J.O de Kat, "An integrated approach towards cost-effective operation of ships with reduced GHG emissions"

Green Ship of the Future Concept Study

A Odense – Lindoe 8500 TEU container vessel was optimised with the following technologies in order to improve energy efficiency and comply with future regulations on NOx and SOx :

- Water in Fuel technology (WIF)
- Exhaust gas recycling (EGR)
- Waste heat recovery exhaust boilers
- Power and Steam turbine technology
- Exhaust gas Scrubber

Extra costs is approximately 10 mill Euro
(Corresponds to approx 10% of newbuilding costs)



Results of new technologies compared to initial design:

- 11-14% reduction of CO₂
- 80% reduction of NO_x
- 90% reduction of SO_x

Including 1.5 MW for additional power for abatement systems (2.5% of ME power)



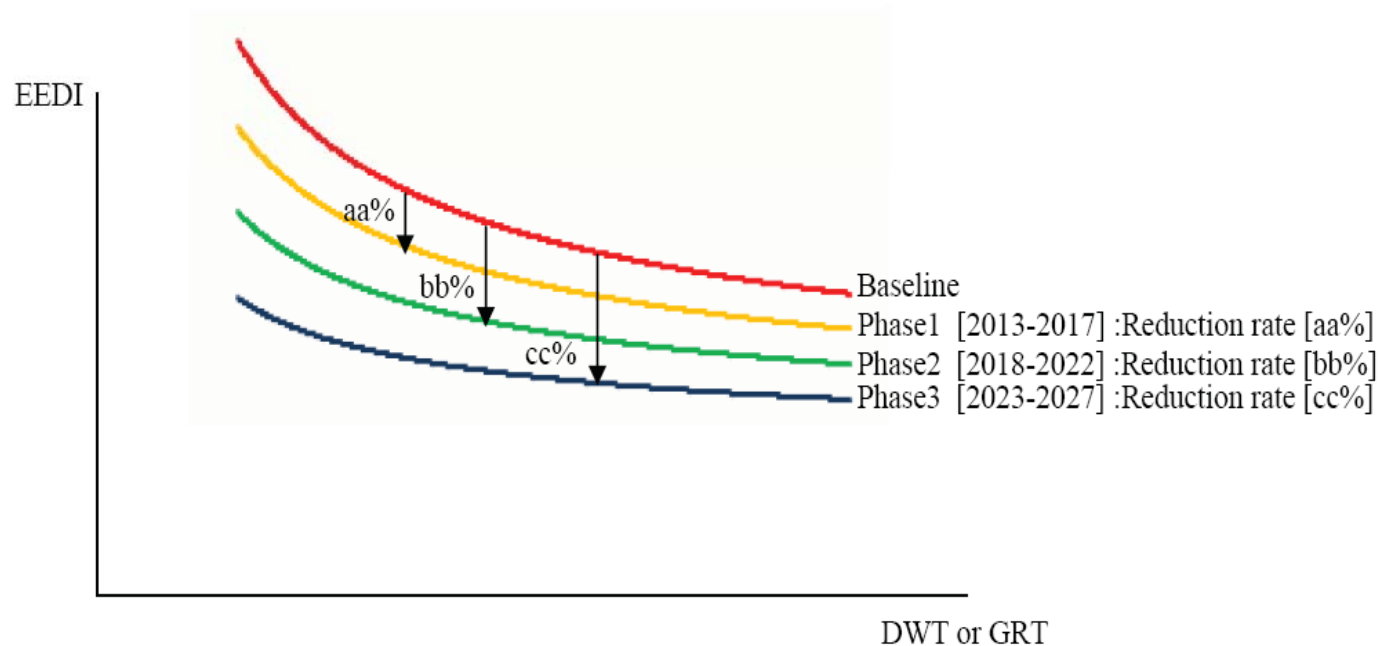
IMO Energy Efficiency Design Index (EEDI)

With IMO's Energy Efficiency Index (EEDI) the shipping industry will have a standardised measure of the vessel energy efficiency of newbuildings:

$$\left(\prod_{j=1}^M f_j \right) \left(\sum_{i=1}^{nME} P_{ME(i)} \cdot C_{FME(i)} \cdot SFC_{ME(i)} \right) + (P_{AE} \cdot C_{FAE} \cdot SFC_{AE}^*) + \left(\left(\prod_{j=1}^M f_j \cdot \sum_{i=1}^{nPII} P_{PII(i)} - \sum_{i=1}^{nEff} f_{eff(i)} \cdot P_{AE,eff(i)} \right) C_{FAE} \cdot SFC_{AE} \right) - \left(\sum_{i=1}^{nEff} f_{eff(i)} \cdot P_{eff(i)} \cdot C_{FME} \cdot SFC_{ME} \right)$$

$f_i \cdot Capacity \cdot V_{ref} \cdot f_w$

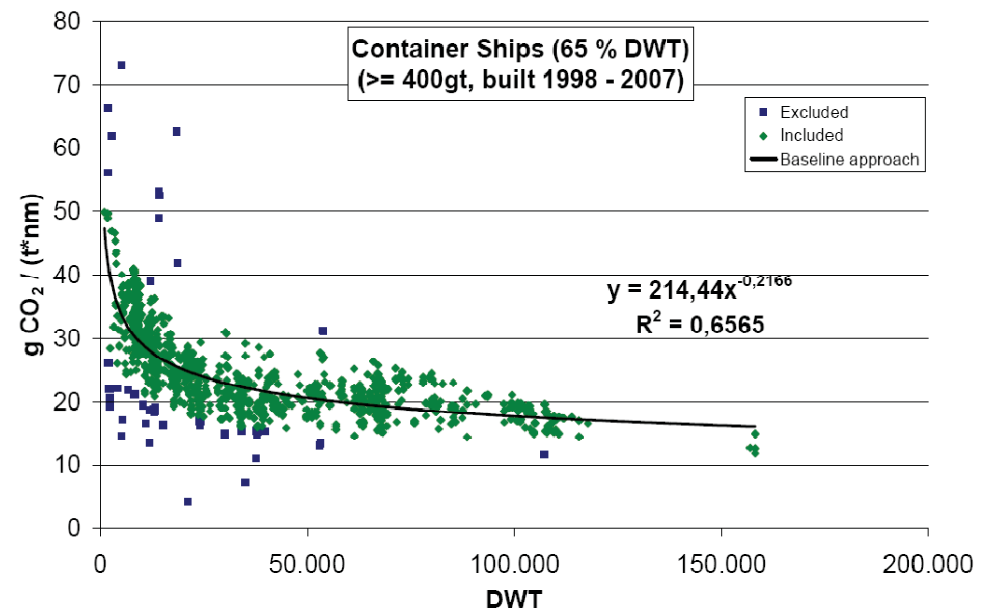
EEDI will be an Instrument for Improvement of Energy Efficiency on Newbuildings ...



Source: IMO MEPC 60/4/36

EEDI from an Owner's Perspective

- Enforcement: Independent third party verification and proven standards will be required for a successful adoption of EEDI in the industry
- Design speed will be an important parameter for EEDI value
- EEDI must be complemented with standards for operational energy efficiency, i.e. IMO operational index



Source: Various IMO documents

Conclusions

- Maersk Business Units have ambitious targets on **environmental performance incl. energy efficiency**
- **Innovative technology solutions** can add to competitiveness: Innovating with suppliers and customers, analyzing, implementing.
- Regulations are important to enforce **long-term (high impact)** investments across the industry.

