

Mecklenburger Metallguss GmbH

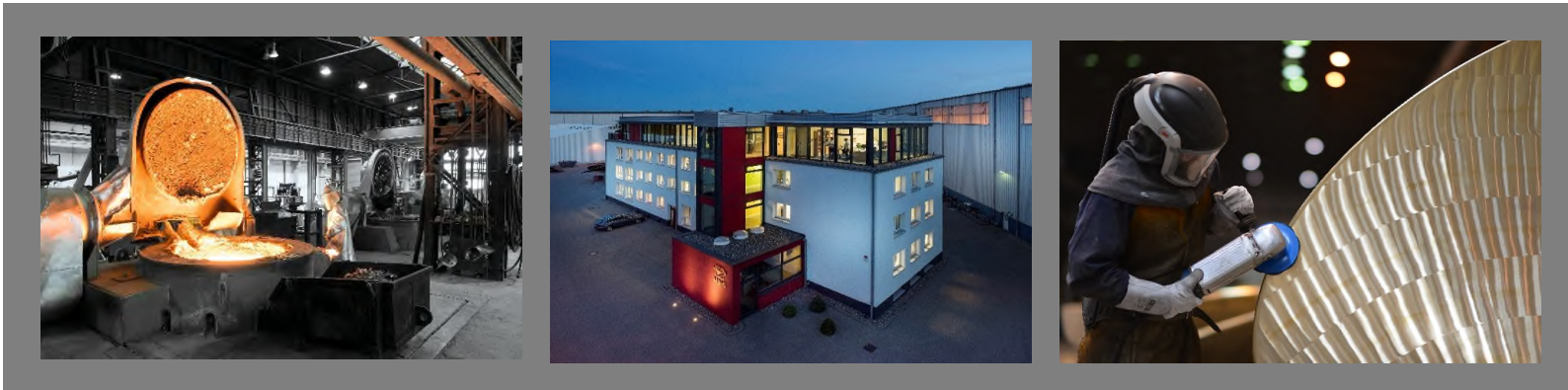
➤ Ship Propulsion Compliance

The efficient ship propeller and
its digital twin

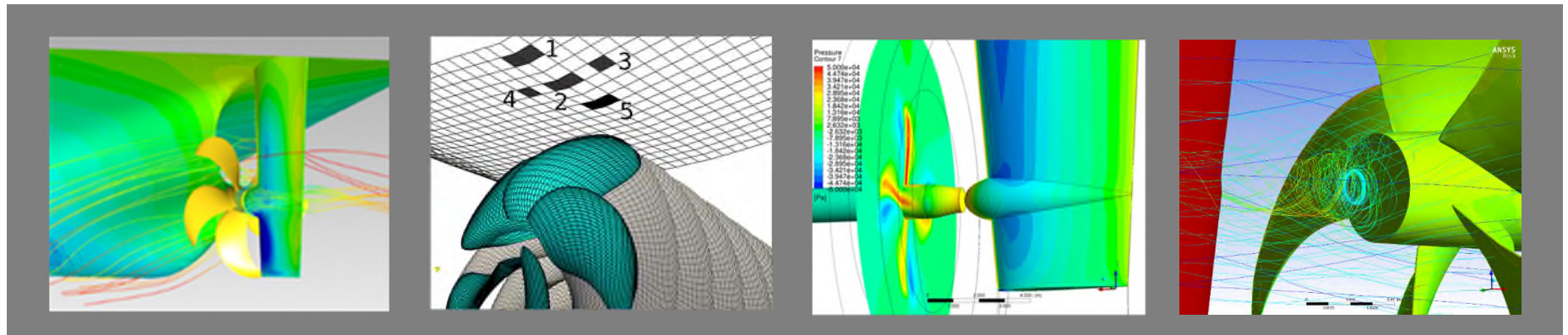
*Der effiziente Schiffspropeller und
sein digitaler Zwilling*

Dr.-Ing. Lars Greitsch
Managing Director / Head of Research & Innovation

MMG – The Propeller Manufacturer



MMG – The Propeller Designer







Container Vessel



Bulker



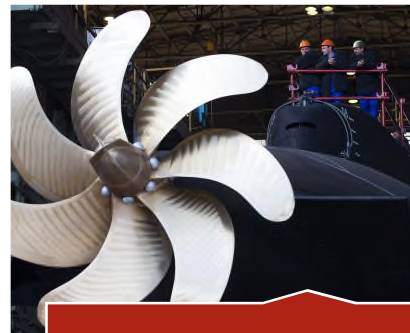
Oil Tanker



LNG Tanker

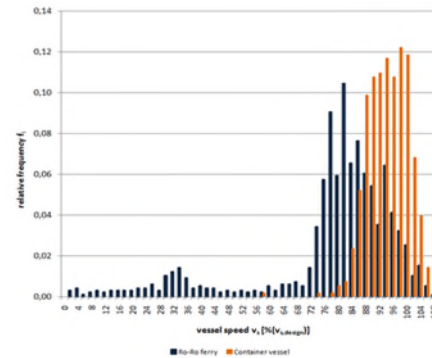


Cruise & Yacht

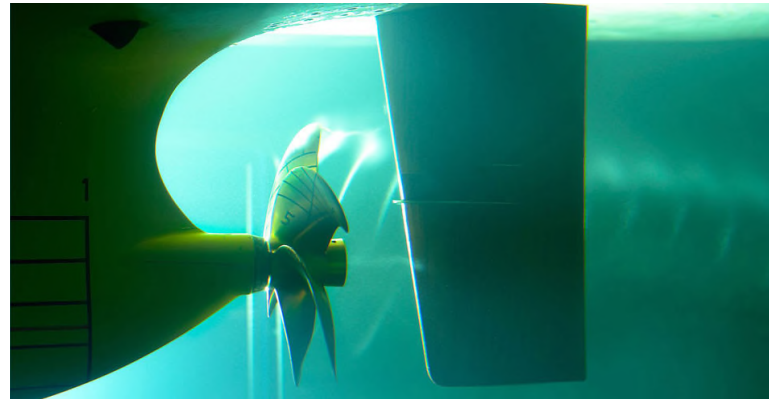


Navy & Research

The challenging *design* scenario



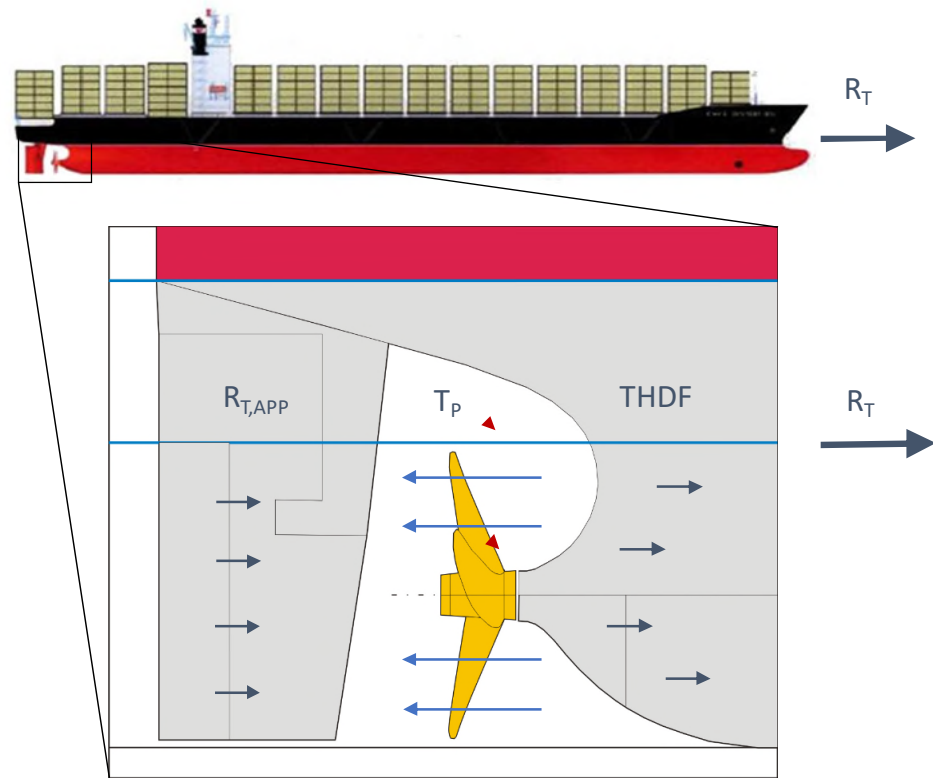
The artificial *testing* scenario



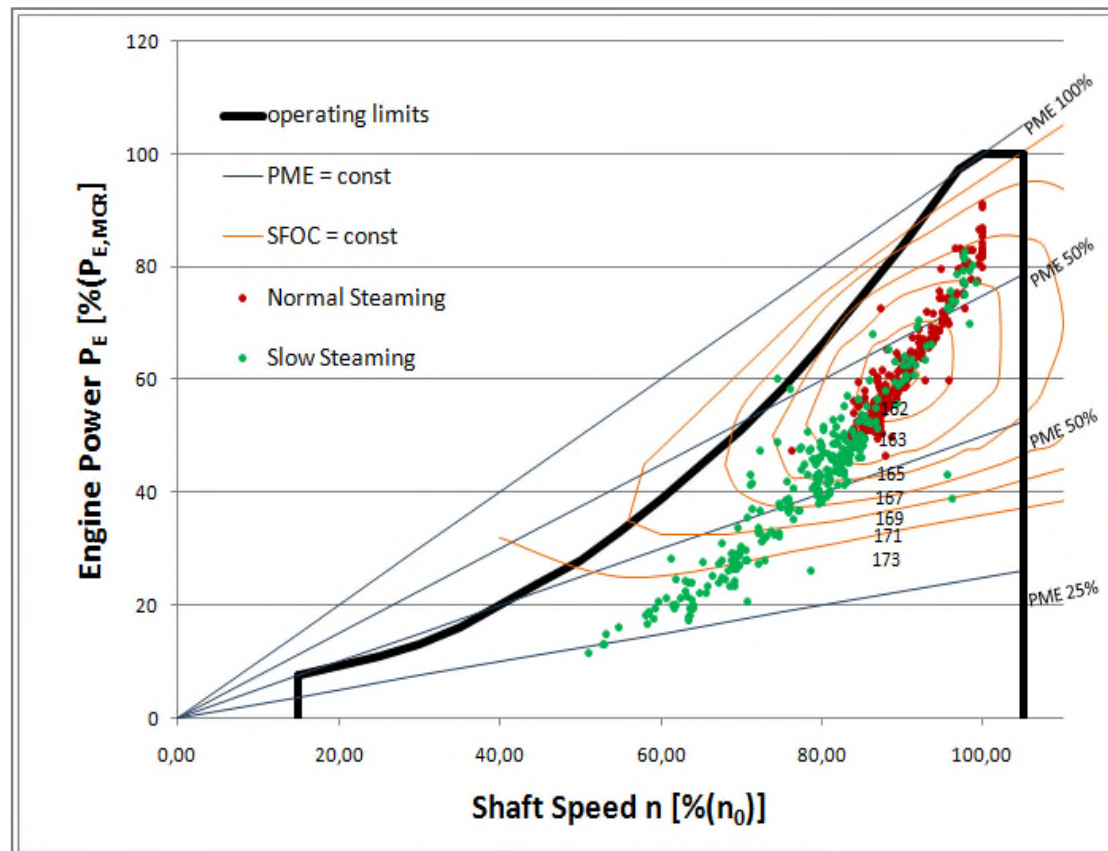
There are *multiple* influences.

- hull form
- pre-swirl
- main engine
- speed profile
- rudder geometry
- propeller diameter
- scale
- roughness

$$\eta_D = \eta_H * \eta_O * \eta_R$$



The rigid *link*
between propeller
and main engine.



Hydrodynamic Predictions?

PREDICTION QUALITY?

Correction factors in the prognosis



DATA QUALITY?

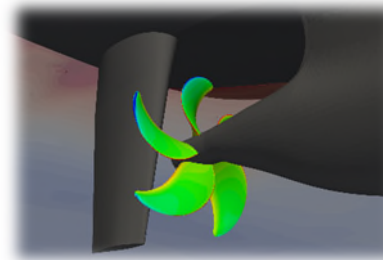
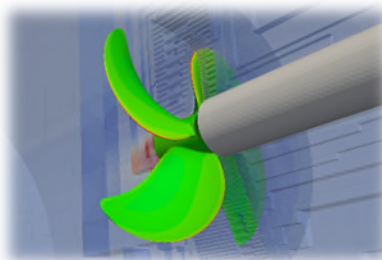
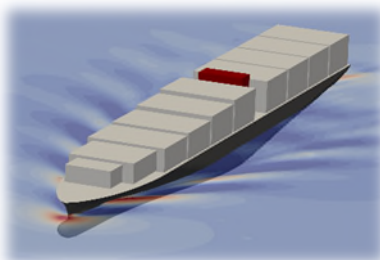


MANUFACTURING QUALITY?

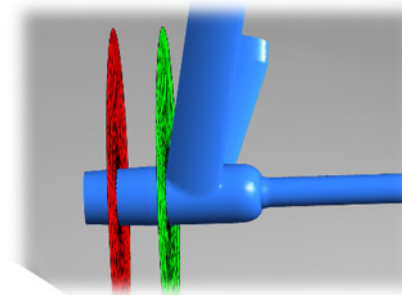
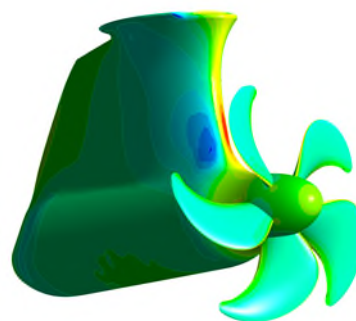
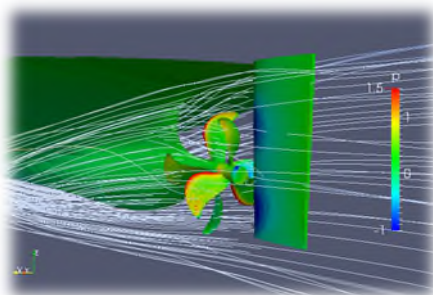
Manufactured geometry vs. designed geometry



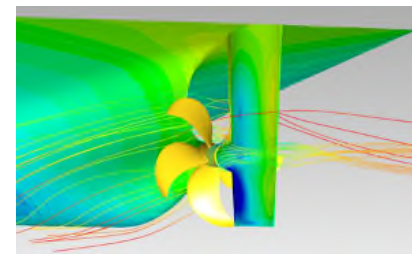
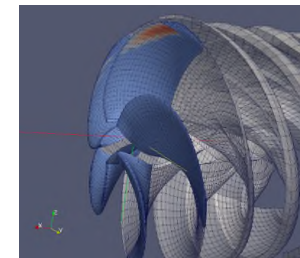
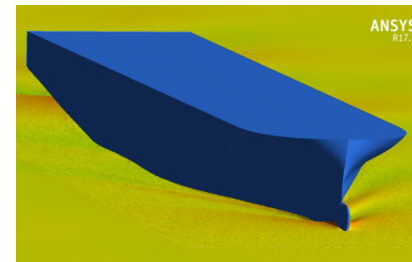
Fully automated towing tank procedures in MMGs daily design process

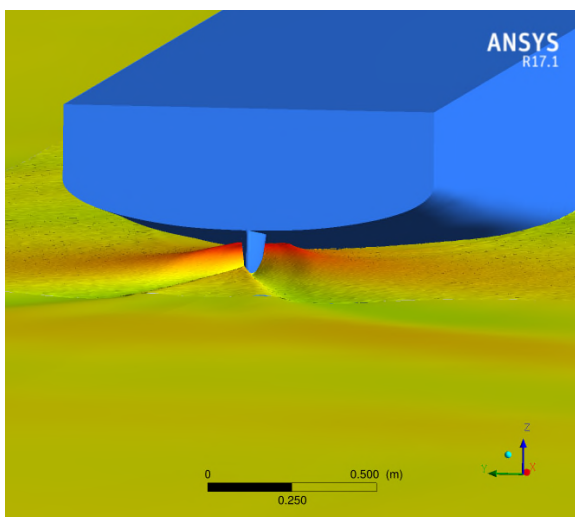


Analysis of complex propulsion systems

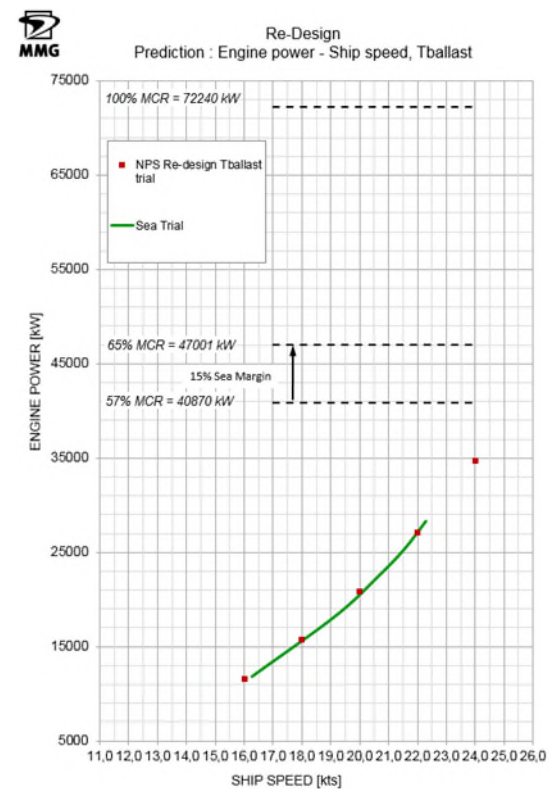
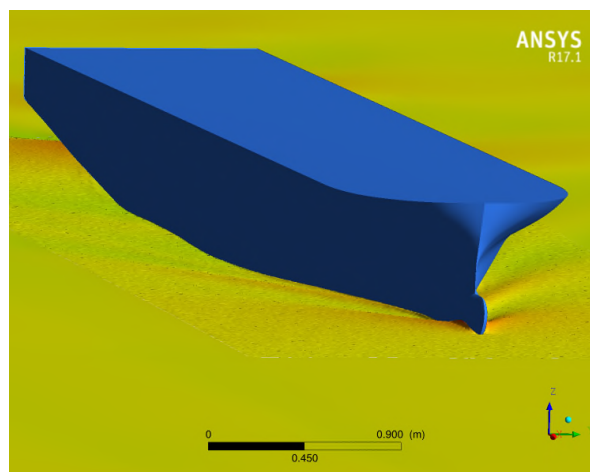


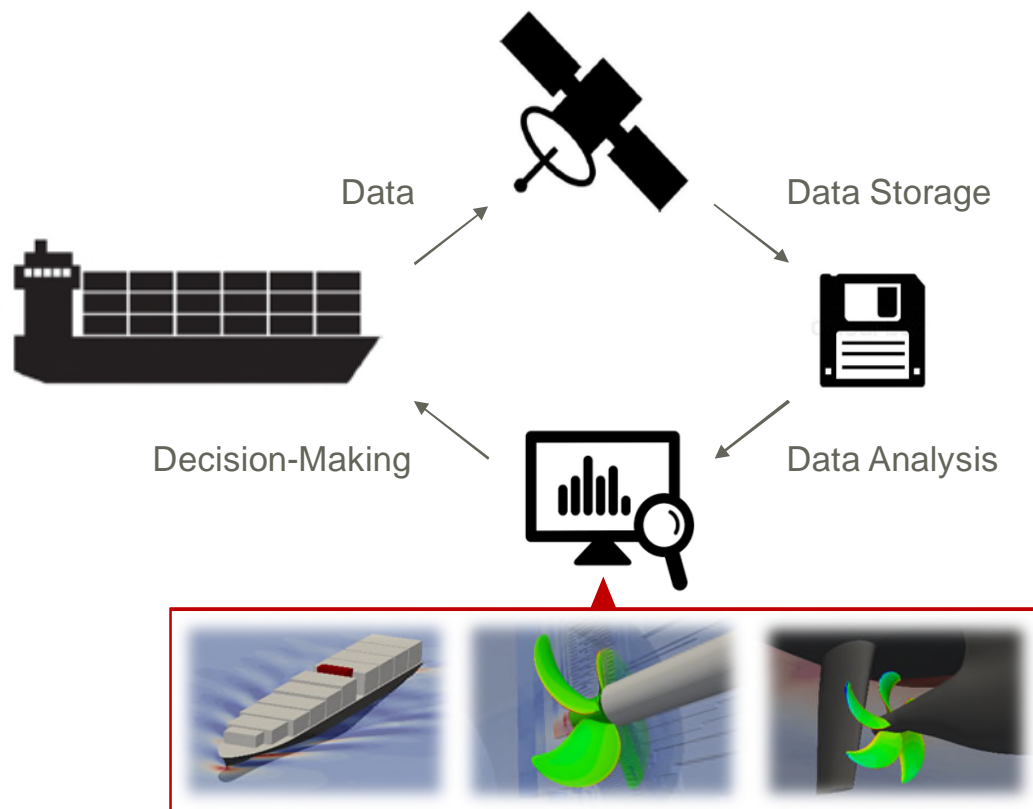
- hull resistance
- propeller open water
- propulsion / speed power behaviour
- cavitation and noise

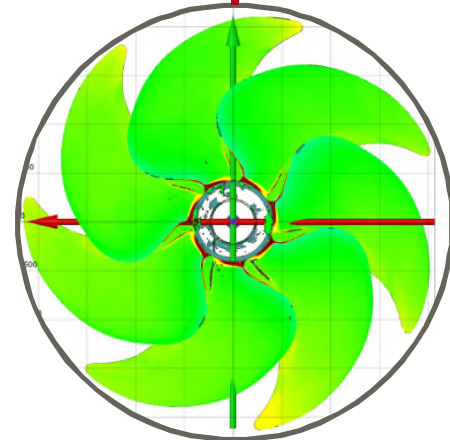
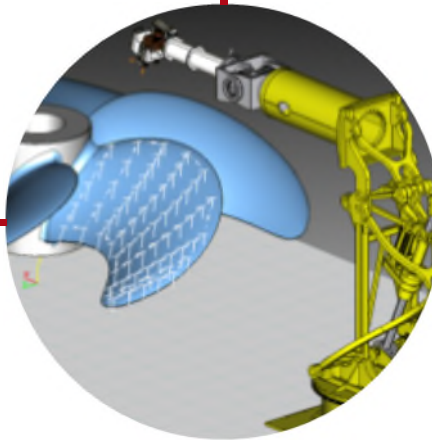
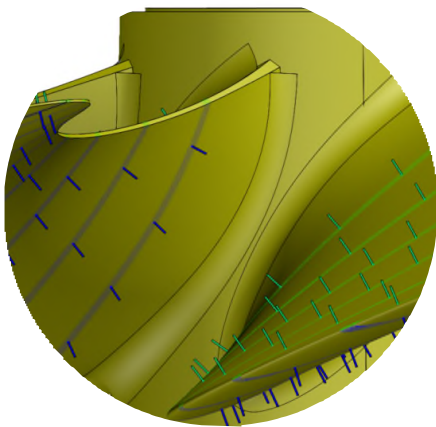
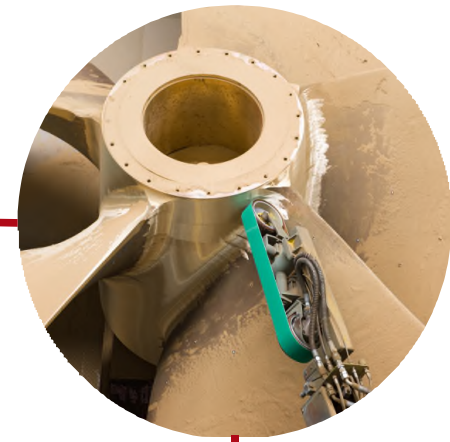


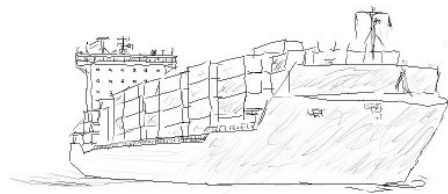


Sea trial: Prognosis and verification

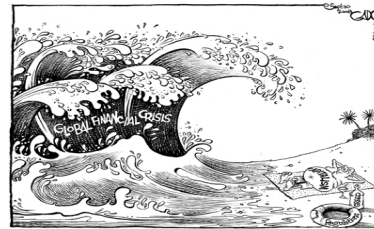




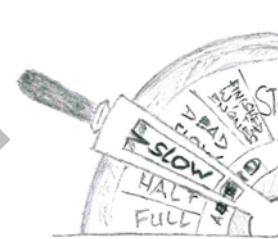




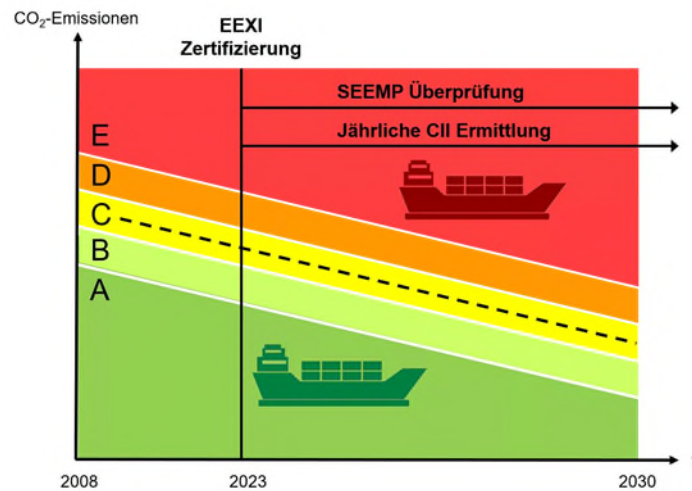
oversupply of tonnage



low charter rates



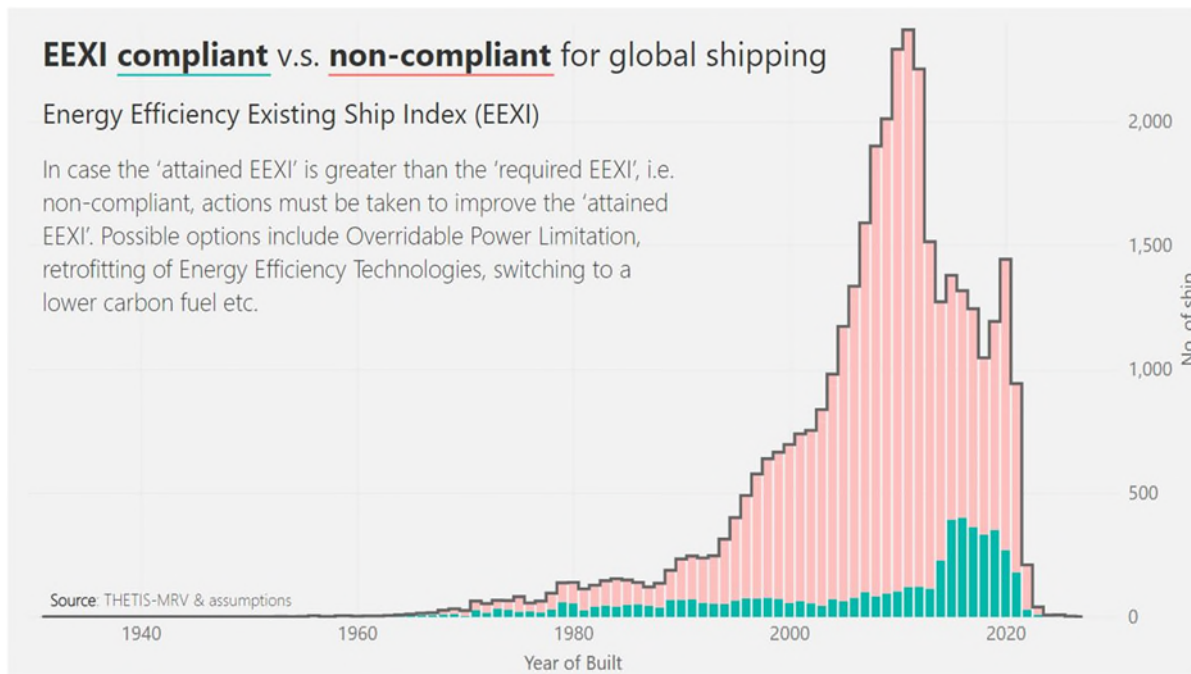
vessel speed reduction



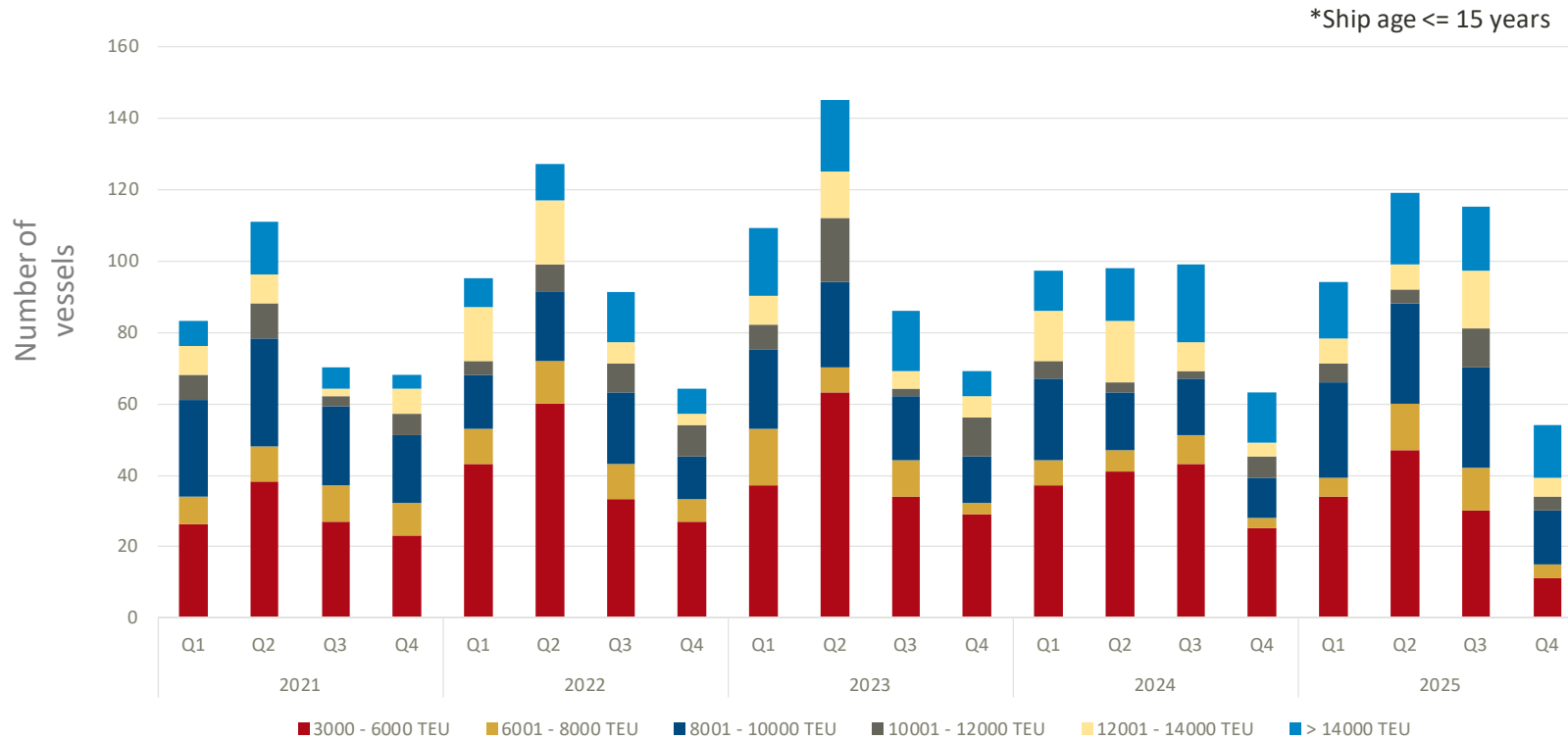
Newest IMO regulations (EEXI, CII) will increase the pressure!

Original propeller design
doesn't deliver best
efficiency in low speed
mode.





3348 ships out of 25955 (last 15 years) are EEXI-compliant, that equals 12,9%
22607 ships out of 25955 (last 15 years) are non-EEXI complians, that equals 87,1%



1857 container ships (>=3000 TEU) are due for hull survey until 2025 (371 per year)

➤ MMG contribution to EEXI



Hydrodynamic Core Expertise

- Analysis of given documentation for specific vessels
- Case study calculations on EEXI readiness

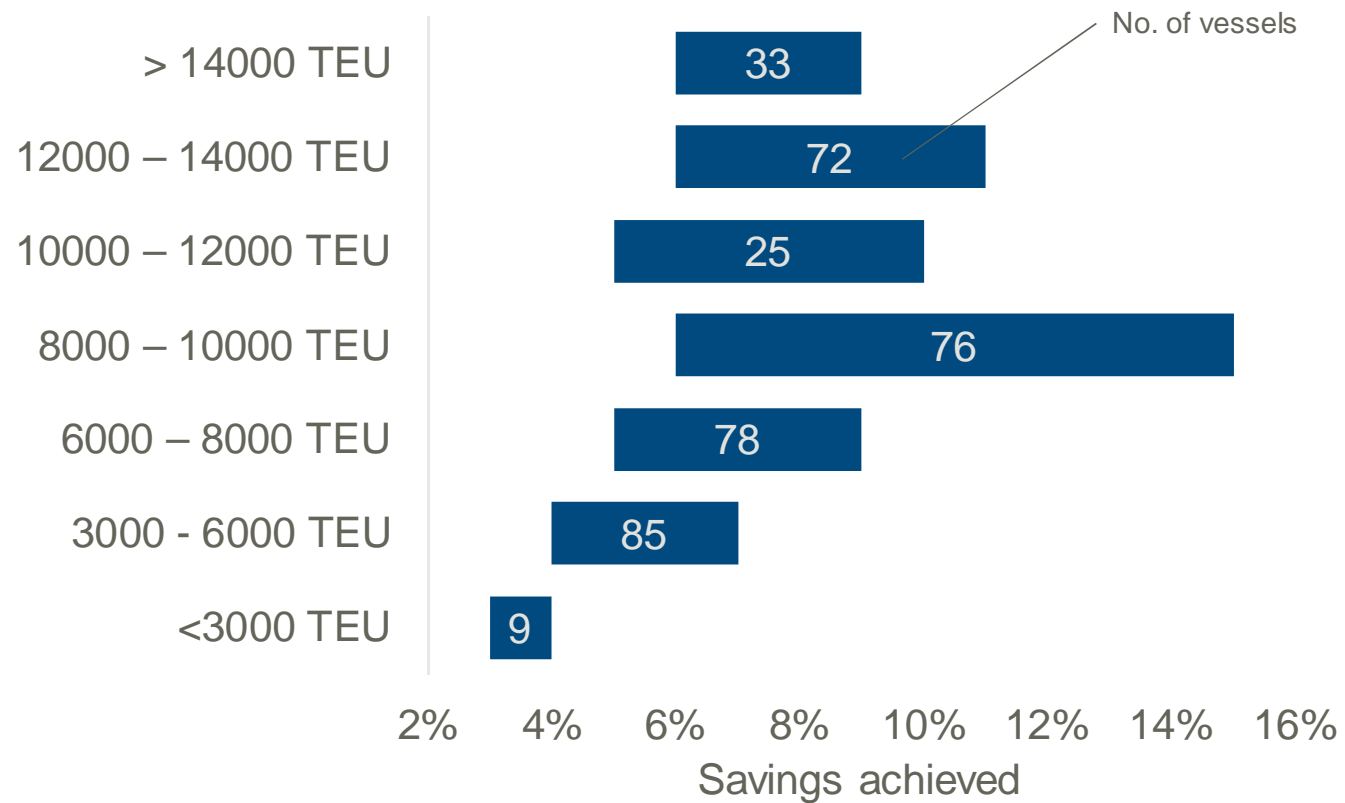
Numerical towing tank

- RANSE CFD analysis including all appendages
- Arbitrary floating/operation conditions



Propeller Redesign

- Application of propeller Redesign
- Increase propulsion efficiency
- Improve EEXI
- Or attain higher top speed





➤ MMG *redesign*

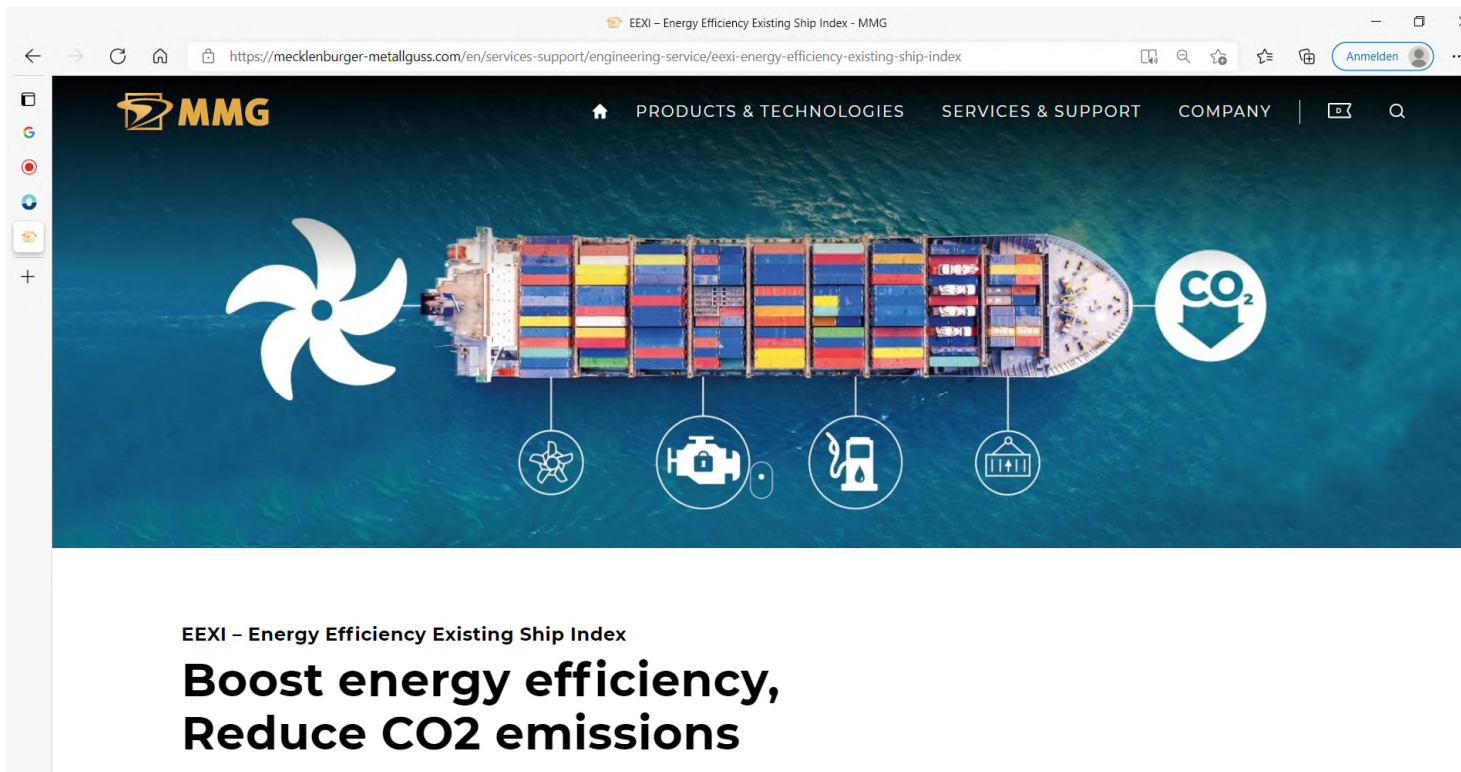


REEDEREI F. LAEISZ



Number 1 in propeller retrofit together with you.





Check our website
or look up “EEXI” at
Google!

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Thank you very much for your attention!