Blade Design at Caterpillar Propulsion

- CAESES® applied in the day to day business

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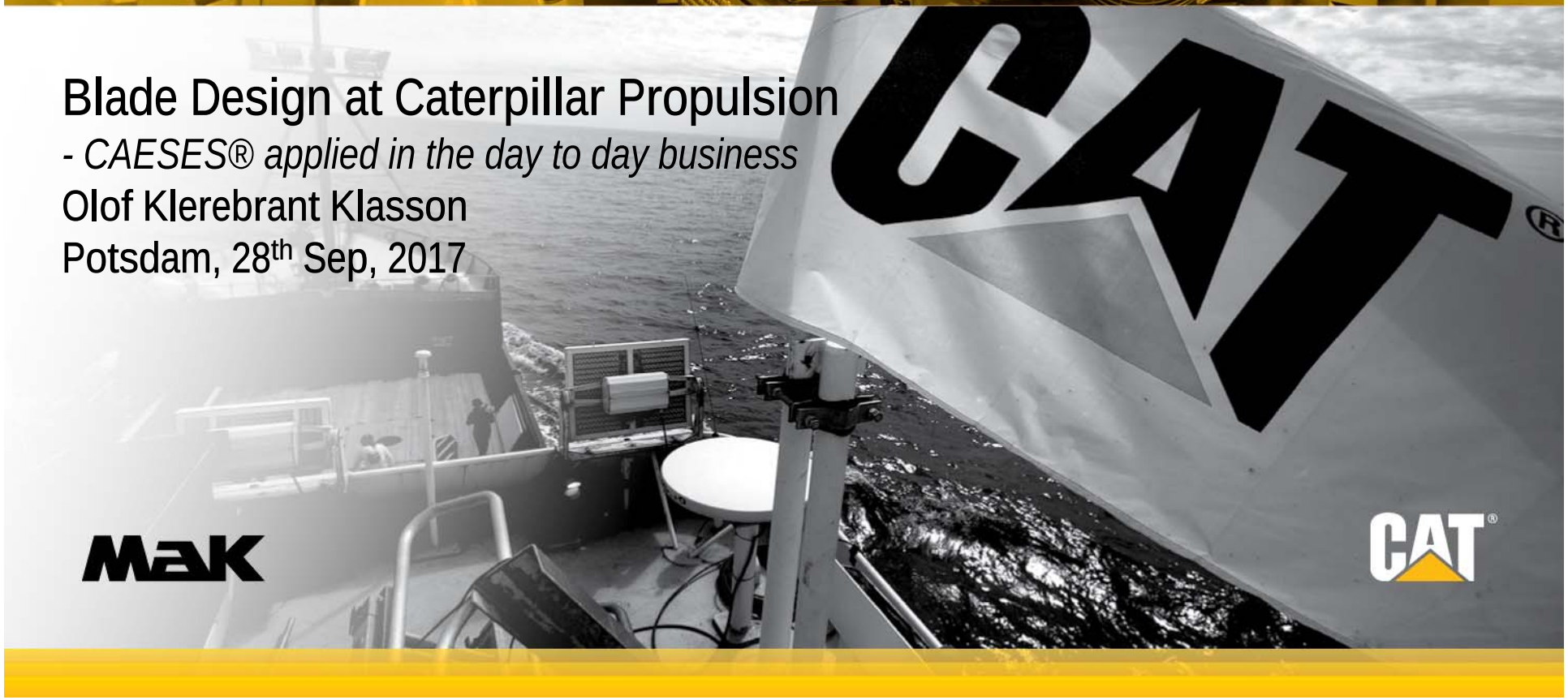
Potsdam, 28th Sep, 2017



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Caterpillar Marine Powers Work on the Water

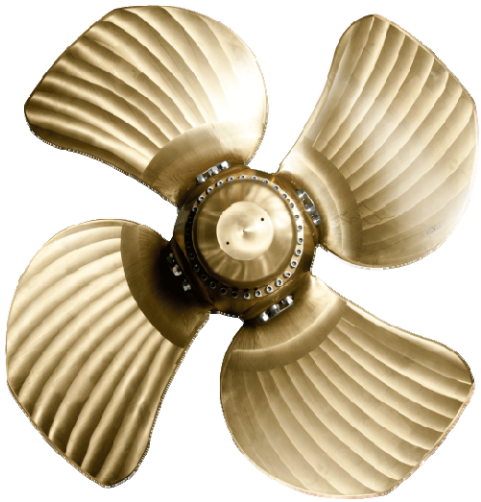
Cargo

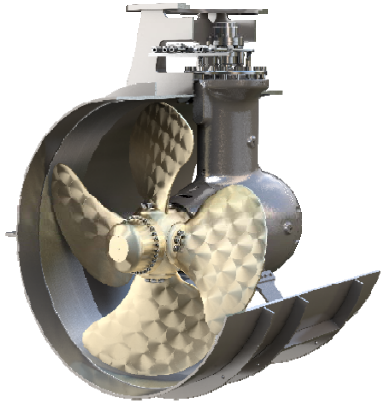
Cruise and Ferry

High Performance

Commercial Workboat

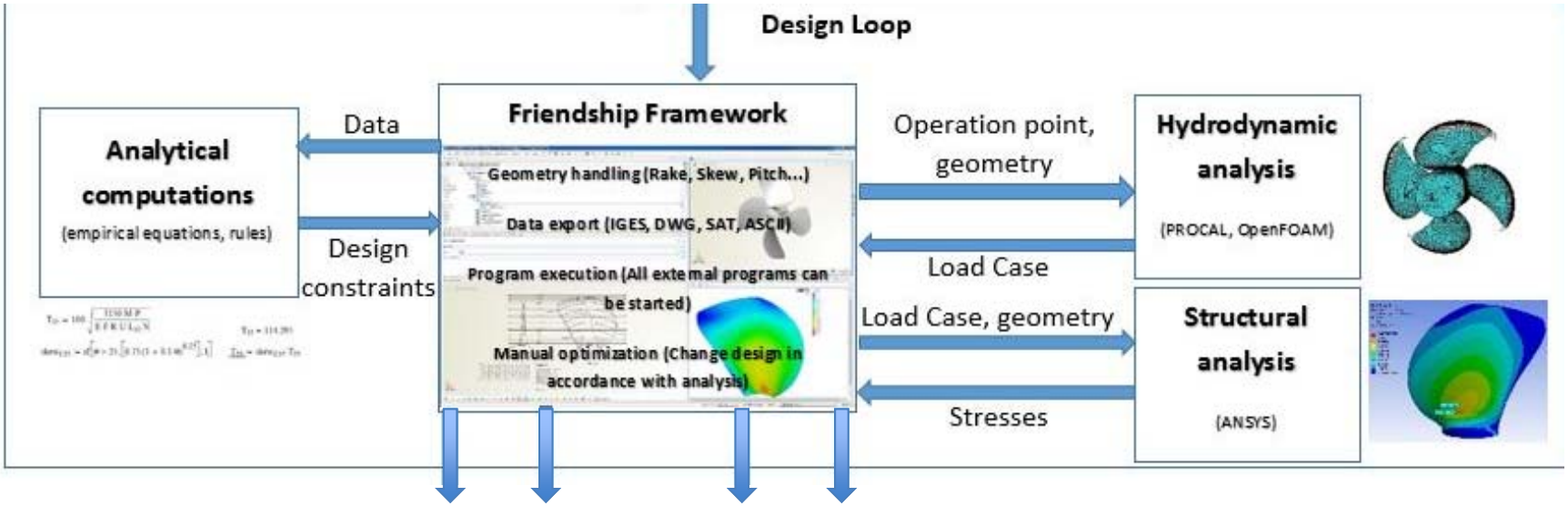
Products





Propeller Design

Preliminary design

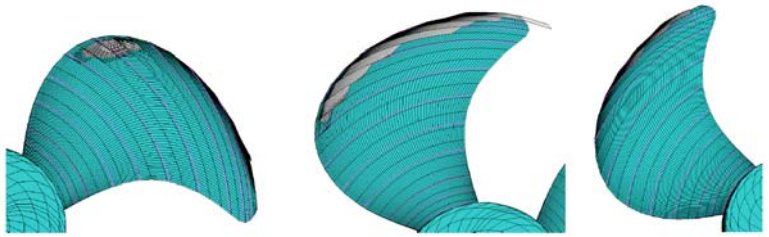


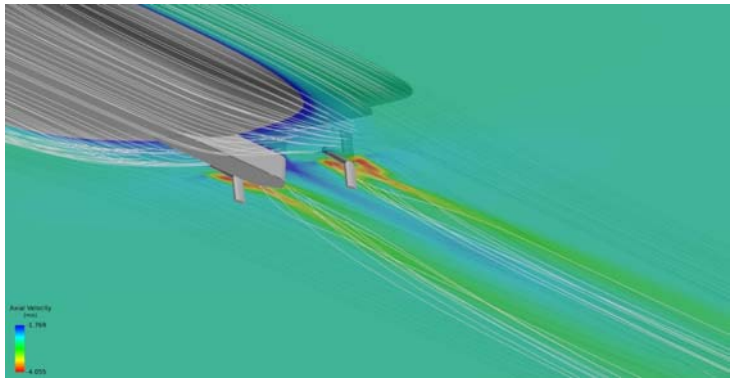
Drawing, reports for classification, design data, 2D-data

Low-fidelity tools

Boundary Element Method (BEM)

- Based on and adapted for propellers
- Fast and automatic
- Accurate in design conditions



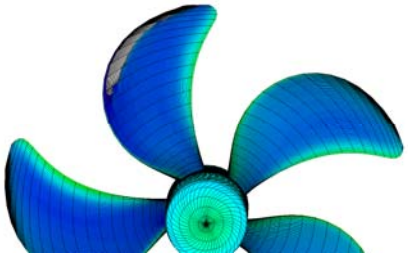


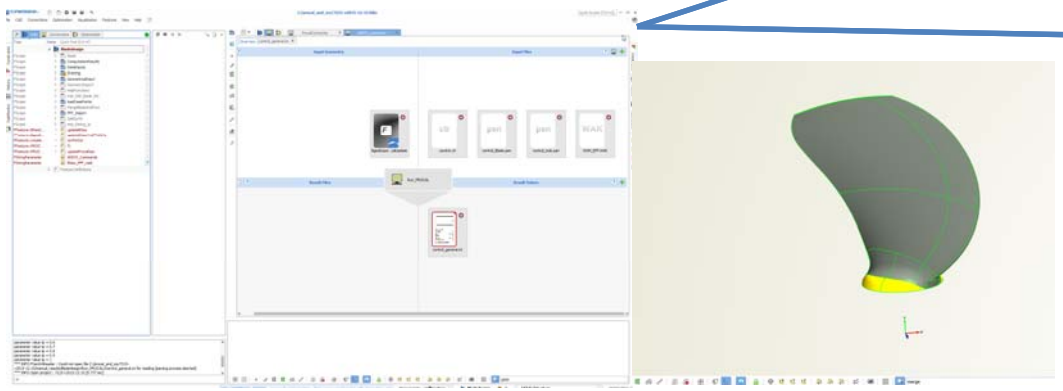
Possibilities:

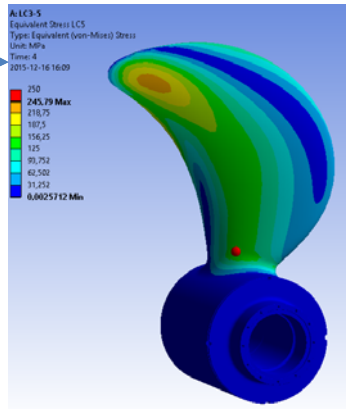
- Prediction of thrust /torque etc with high accuracy
- Prediction of cavitation behaviour and inception
- Pressure fluctuations (pulses) from sheet cavitation (1st BPF)
- Broadband pressure fluctuations and underwater radiated noise (URN)

Computations

- Automatic 3D-geometry including fillet generated directly by CAESES
- Direct connections implemented to the following design tools
    - OpenFOAM (CFD-Code)
    - ANSYS (FEM-Code)
    - PROCAL (BEM-Code)
- Possibility to monitor e.g. Propeller efficiency, stress due to hydrodynamic loads, cavitation properties etc. as design is made with just a click. Saves a significant amount of time for each blade design

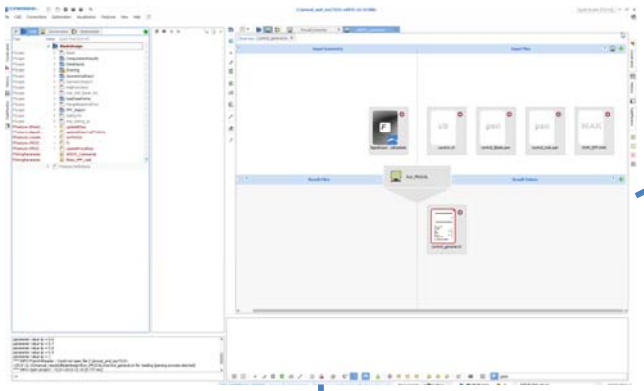


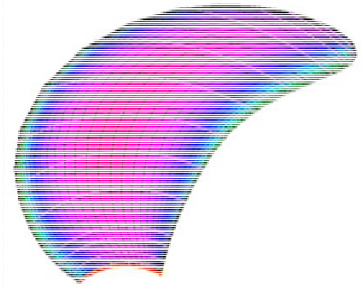


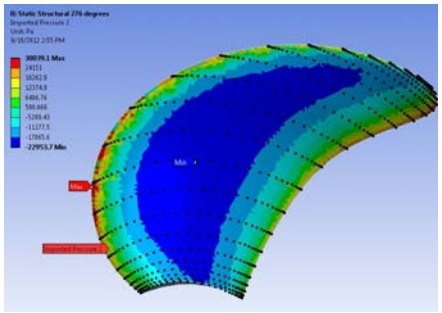


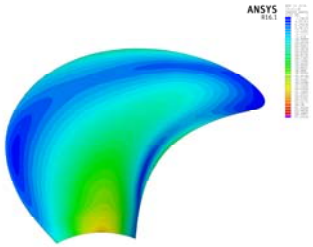
Hydro loads

- Hydro loads are computed using BEM
- CAESES geometry is exported to ANSYS
- BEM loads on blade is extracted and mapped to ANSYS grid
- Using one software connection



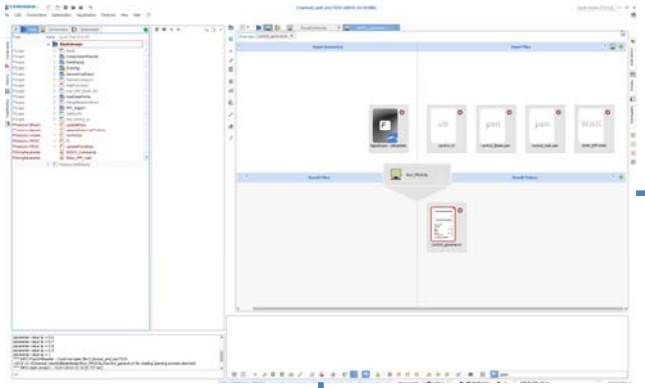


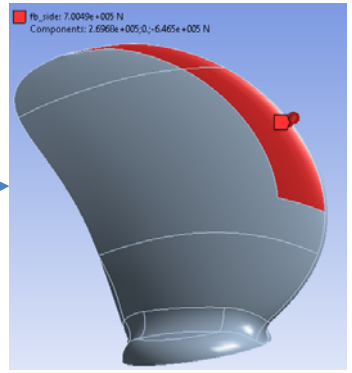


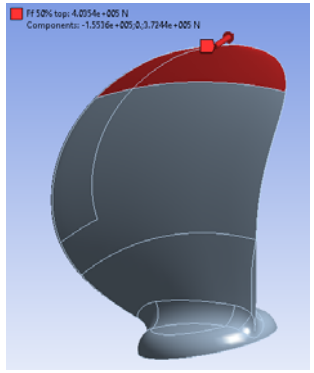


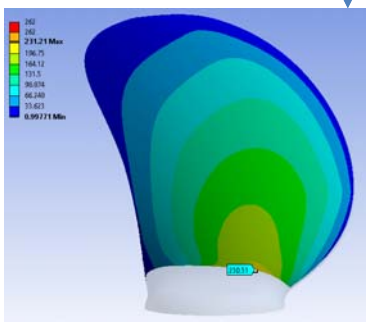
Ice loads

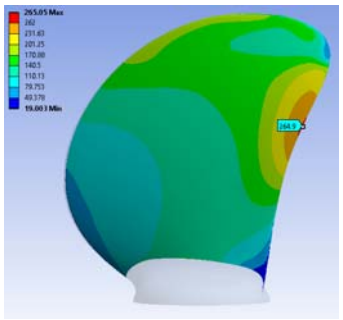
- Ice loads are computed using the class rules
- Loads, application surfaces and geometry are exported by CAESES



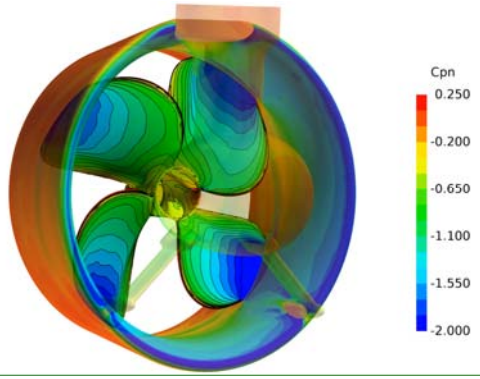




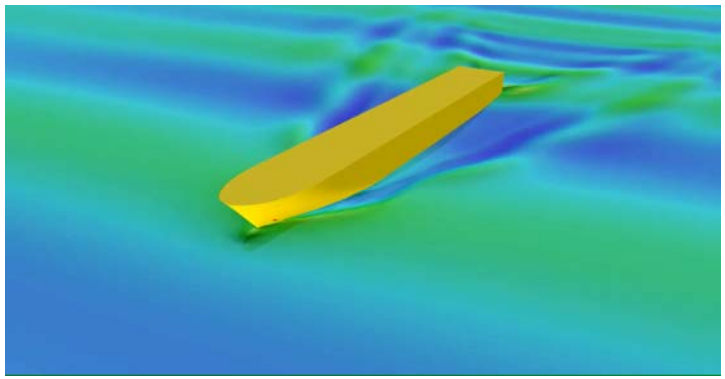




High-fidelity tools

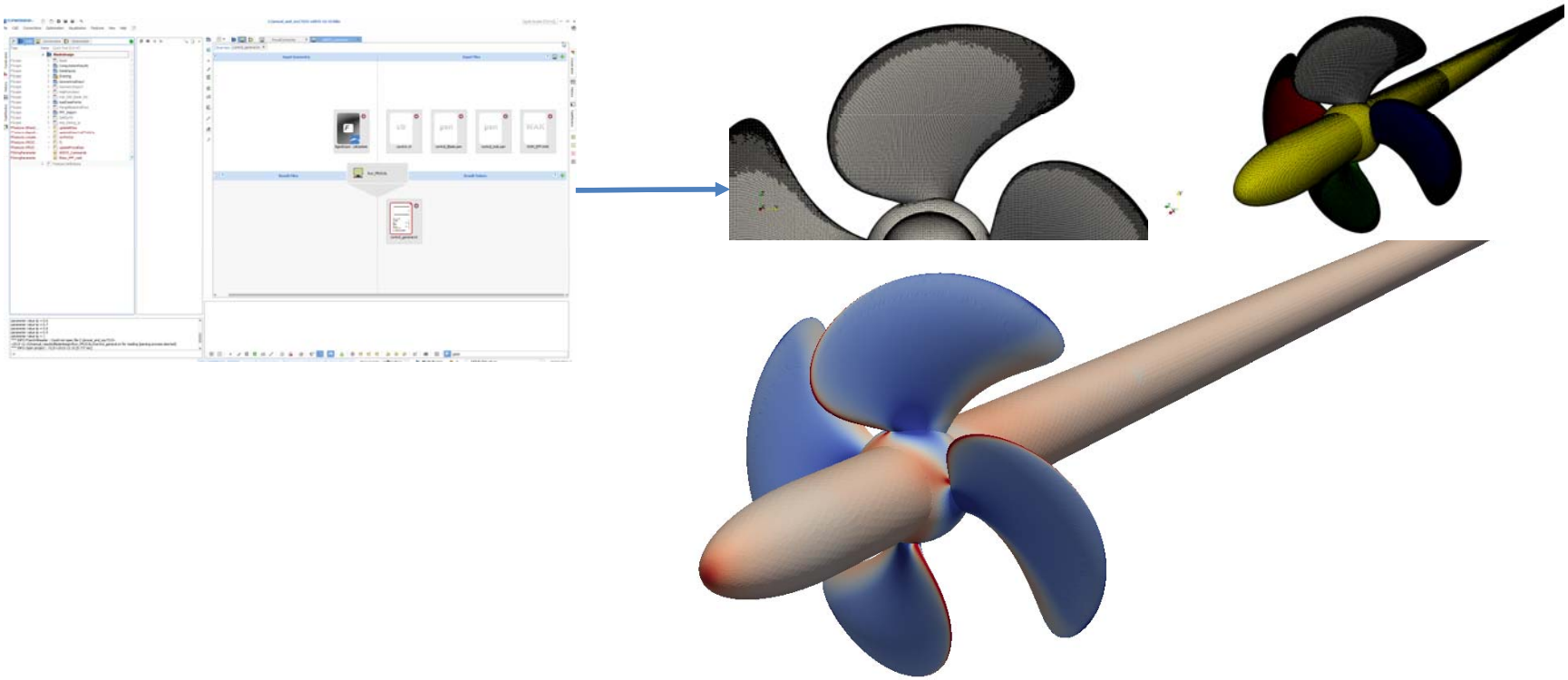


- Hull Resistance
- Powering Estimations
- Wake Field
- Scale Effects
- Propeller Design Evaluation



OpenFOAM

- An automatic grid- and solve- sequence using OpenFOAM from an stl-input has been developed and validated, giving satisfacory results



References

AHTS

Name:
Loke Viking
Type:
AHTS
Length:
86 m
Builder:
Astilleros Zamakona
Engines:
14 000 kW MaK
Propulsion:
Berg 1230 BCP Twin Screw

RESEARCH

Name:
Polarcus Samur
Type:
Seismic Survey Vessel
Length:
84 m
Builder:
Drydocks World, Dubai
Engines:
7400 kW Electric motors
Propulsion:
Berg BCP 1140 Twin - Ice 1A

CARRIER

Name:
Sigrid
Type:
Spent Nuclear Fuel Carrier
Length:
99,5 m
Builder:
Damen Shipyards, NL
Engines:
1938 kW MaK
Propulsion:
Berg BCP 950f Twin, BFTT 315 Twin

谢谢

ありがとうございました

Bedankt

Děkuji

СПАСИБО

MERCI

GRAZIE

THANK YOU!

TACK

GRACIAS

OBRIGADO

TERIMA KASIH

DZIĘKUJĘ

KÖSZÖNJÜK

DANKE

감사

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