MARINTEK
Norwegian Marine Technology Research Institute

FoU-arbeid i Skipsmodelltanken

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Forskningssjef

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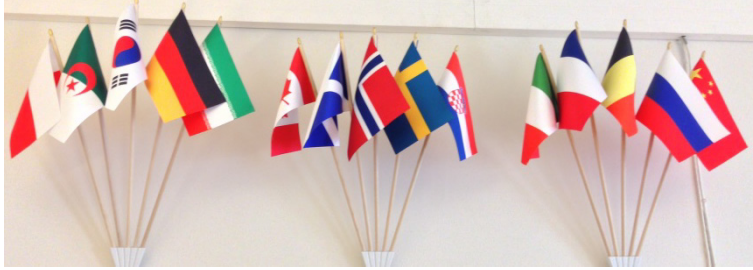
SINTEF

Ship Technology Dept.

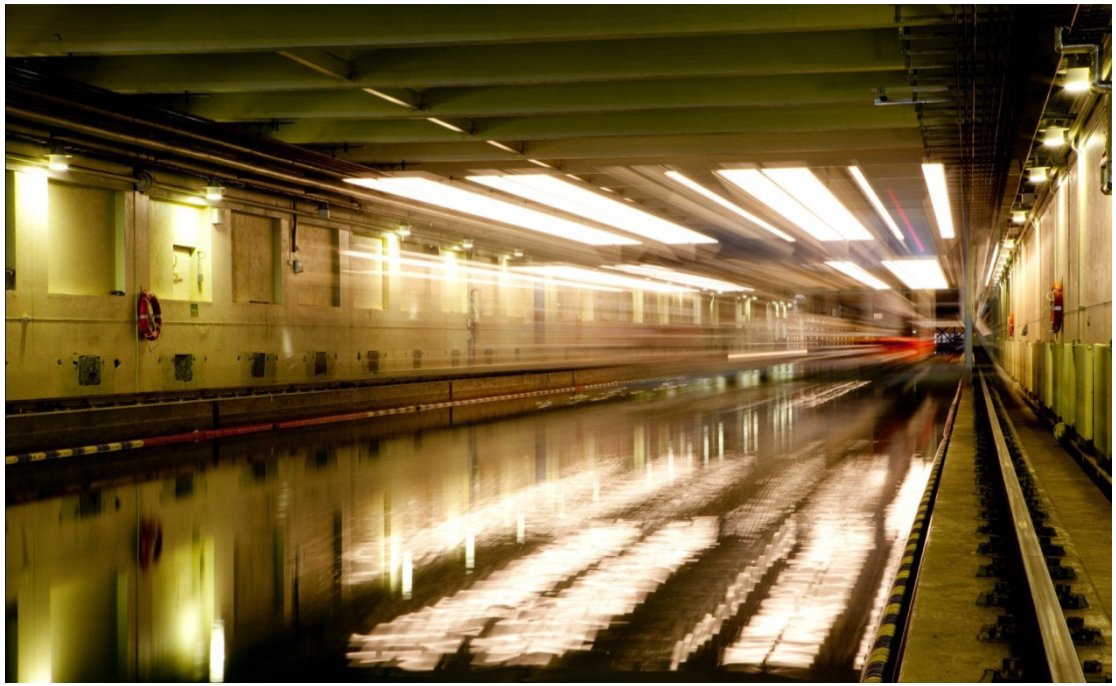


- 30 researchers from 15 different countries
- 27 engineers and technical staff in workshops and laboratories
- Operation and maintenance of:
  - towing tank
  - cavitation tunnel
  - sloshing test laboratory
  - Life boat model testing facility
- Using other hydrodynamic laboratories:
  - Ocean basin
  - Marine Cybernetics Laboratory
- Model and instrumentation design and production
- Development and maintenance of several software including:
  - Vessel Simulator VeSim
  - Engineering platform ShipX
  - Propeller design and analysis tools AKPD amd AKPA

Main activity fields

- Resistance
- Propulsion & Cavitation
- Seakeeping & Manoeuvring
- Ship loads and Responses
- Marine operation incl. arctic
- Computational Fluid Dynamics (CFD)
- Ocean energy
- Research
- Development
  - Product development incl. design assistance
  - Method development
  - Software development
- Simulation
- Verification
  - Model testing
  - Full scale trials
  - Numerical calculation
- Problem solving

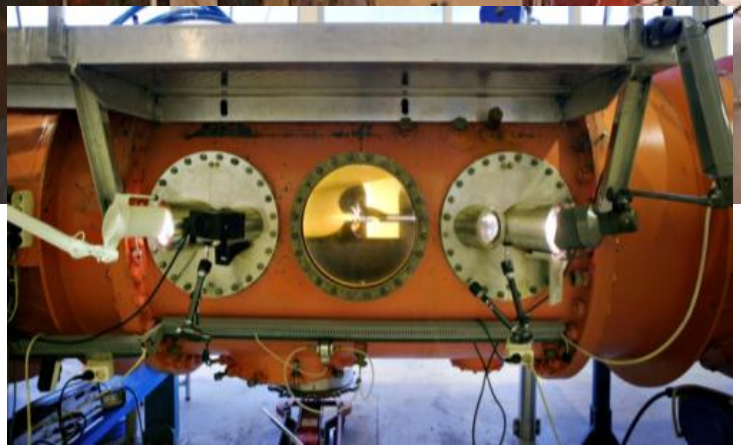
Towing Tank

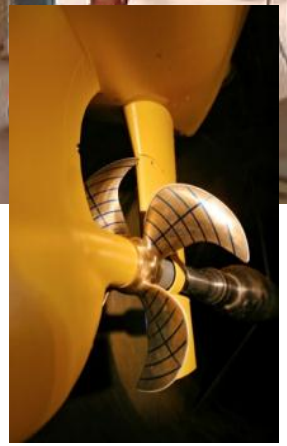


Ship Model Tank
I+III data:

- **Length: 260 m**
- **Width: 10.5 m**
- **Depth: 5.6/10.0**

Cavitation tunnel

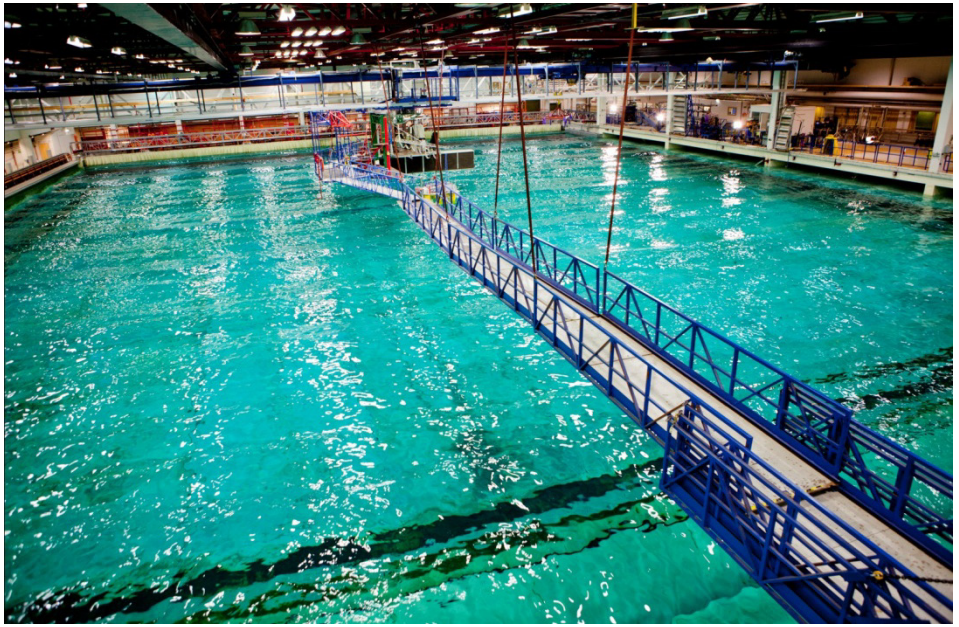


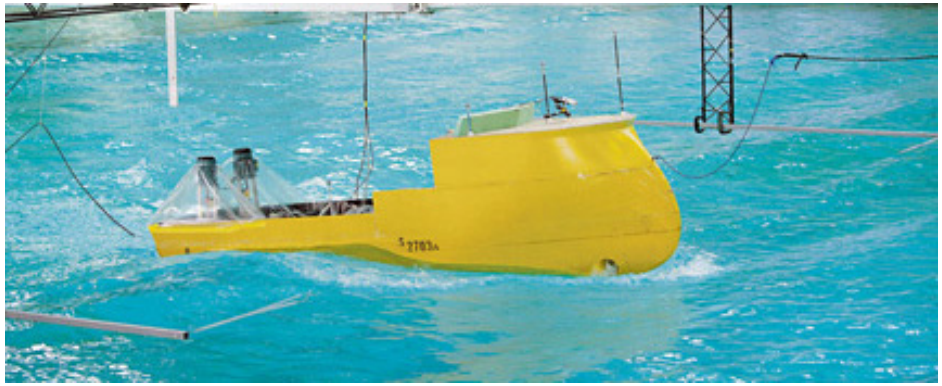


Cavitation tunnel data:

- **Diameter of working section: 1.20 m.**
- **Length of working section: 2.08 m.**
- **Maximum water velocity: 18 m/sec.**

Ocean basin

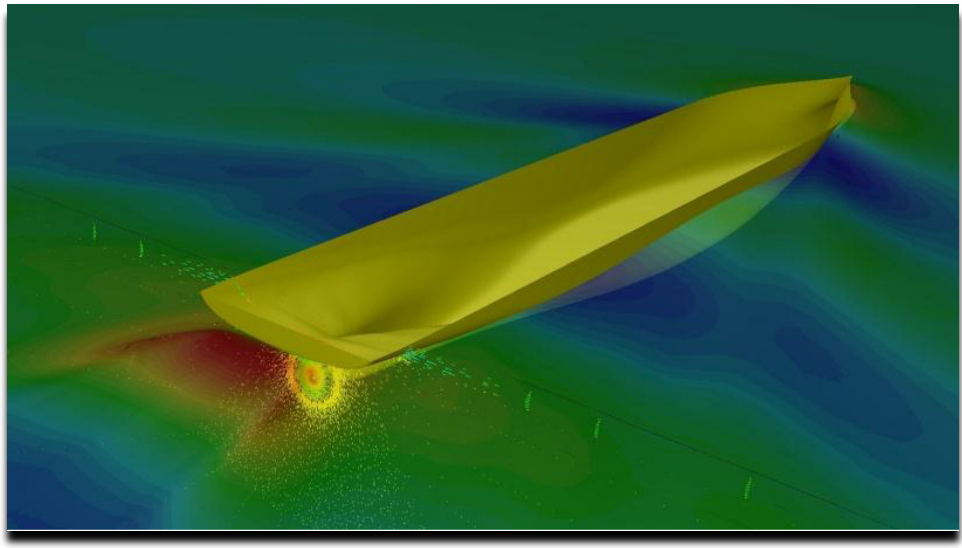




Ocean basin laboratory data:

- **Length:80 m**
- **Width: 50 m**
- **Depth: 0-10 m**

KPN PropScale 2013 – 2016
Full Scale Performance Prediction for Energy Efficient Ship Design



- MARINTEK
  NTNU, HiÅ
  Rolls-Royce, Havyard,
  Vard, Scana-Volda
  TUHH, CSSRC

- Total budget kNOK 12 250

- To acquire knowledge about performance of the vessels equipped with novel propulsion systems in full scale, and to quantify scale effect on propulsive characteristics of these vessels through the development and application of CFD methods.

KPN Sea trials and model tests for validation of shiphandling simulation models 2013-2016

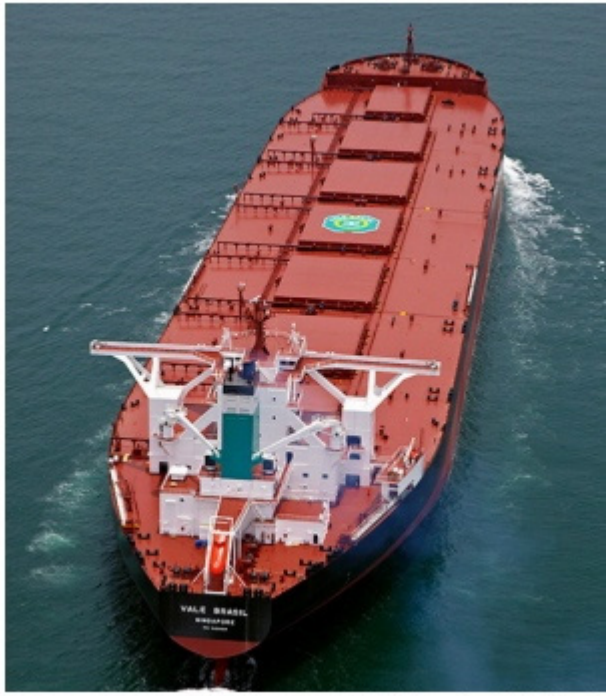
- MARINTEK, NTNU, SM&SC,Rolls-Royce Colorline, Island Offsore,Torghatten Nord DNV-GL (Marine Cybernetics), Singapore, Belgium, Brasil, Japan

- Total Norwegian budget kNOK 17 000

- To develop and apply a method for validation of numerical ship models used in engineering tools for studies of ships' manoeuvring performance in deep and restricted waters and ship handling training simulators.

Liquefaction study

- The model tests replicate the behaviour of a ship and its cargo at model scale.
- The test rig used comprises of a six degrees of freedom vessel motion simulator that produces model scale motions based on ship motion and sea-state inputs.
- The rig models scaled motions at a given position on a ship with each degree of freedom being independent and having the ability to be enabled / disabled accordingly.

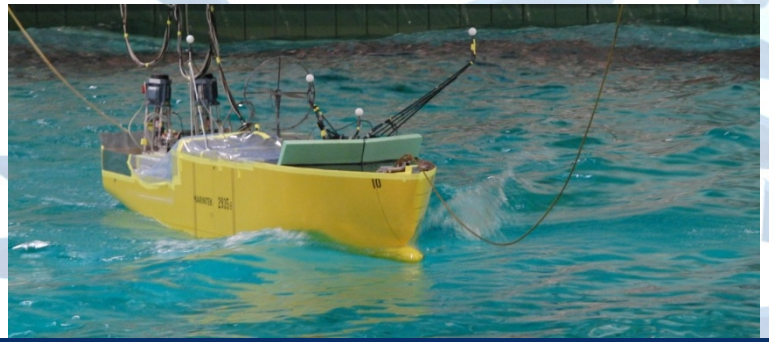


The 362-meter Vale Brasil

Photo: Report Cargo Liquefaction published by Gard AS

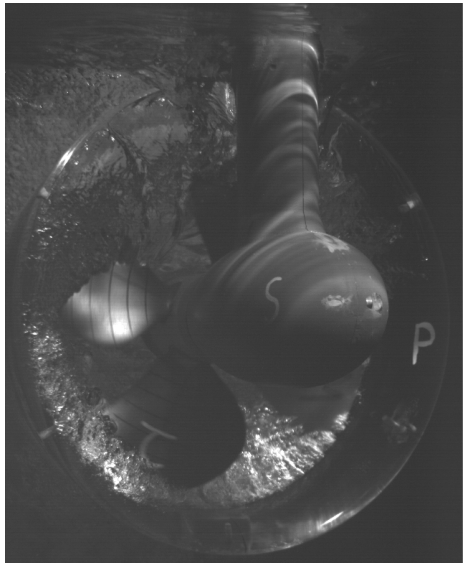
BIP CIV ARCTIC - Construction and intervention vessels for Arctic oil and gas

- MARINTEK, NTNU, Statoil, Vard, VTT, Aker Arctic
- To extend the operational season for construction and intervention vessels in regions with seasonal ice.
- A revised intervention philosophy where unplanned intervention takes place in periods with seasonal ice
- Operational limits based on vessel and subsystem motion characteristics
- Vessel design to optimize operational envelope and minimizing the environmental footprint



Rolls-Royce UTC “Ship Performance in a Seaway” 2005-2015

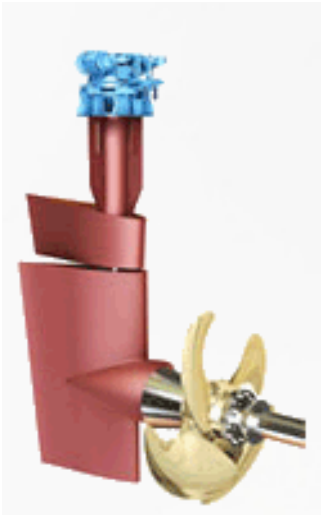
- MARINTEK, NTNU, Rolls-Royce
- Propulsion in seaways, Seakeeping, Manoeuvring
- Development of ship simulator (VeSim) and ShipX
- Model testing and development of related techniques



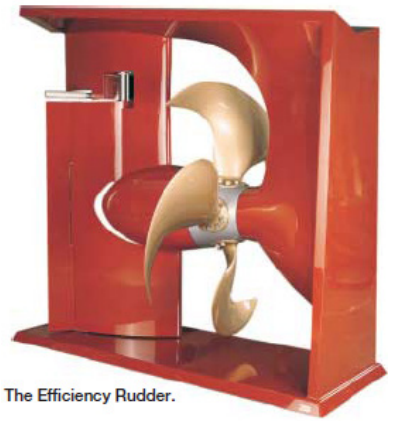
Energy saving devices

BECKER - MEWIS DUCT

ECO-STATOR



ROLLS-ROYCE PROMAS

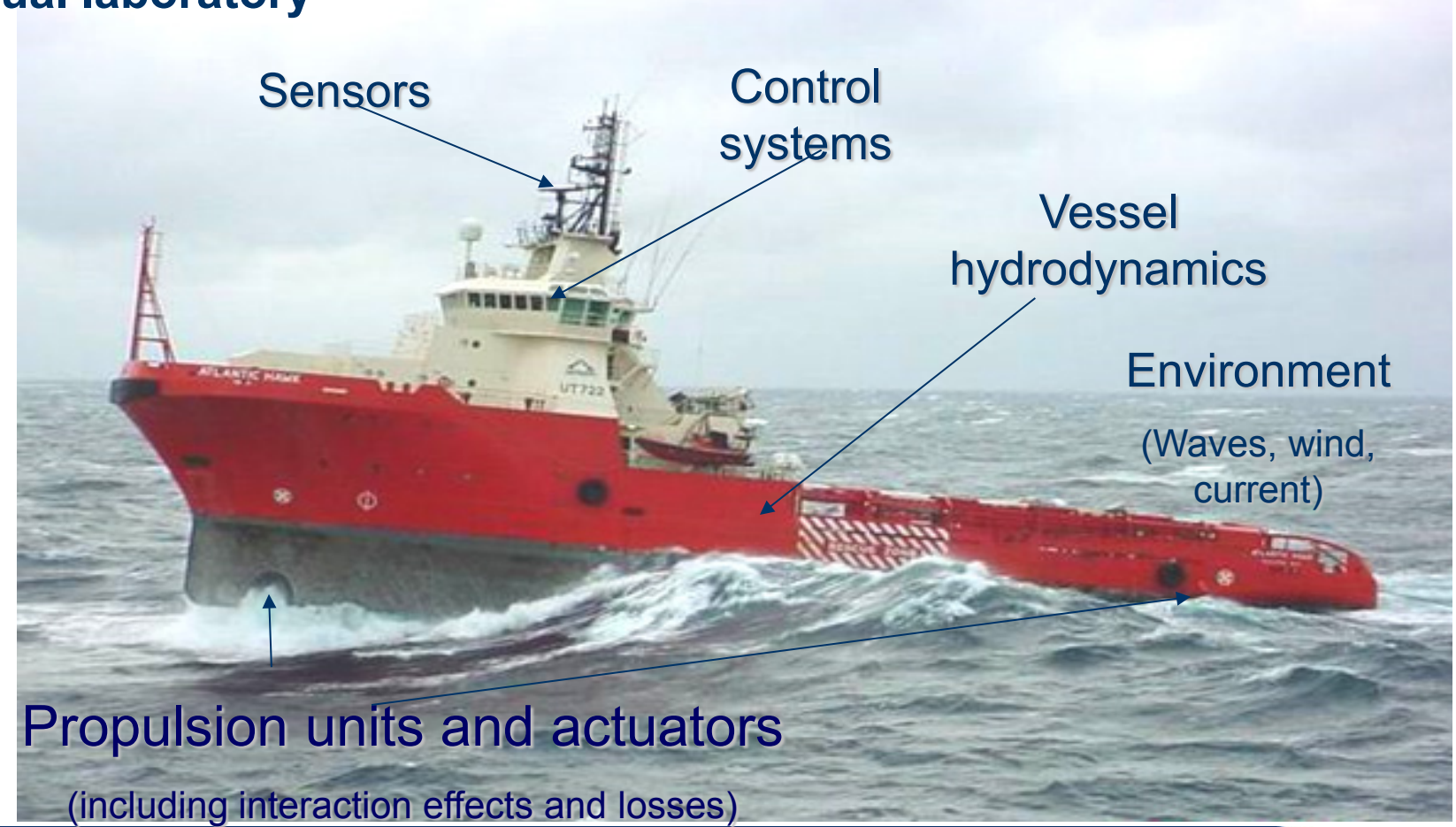


WÄRTSILÄ EFFICIENCY RUDDER

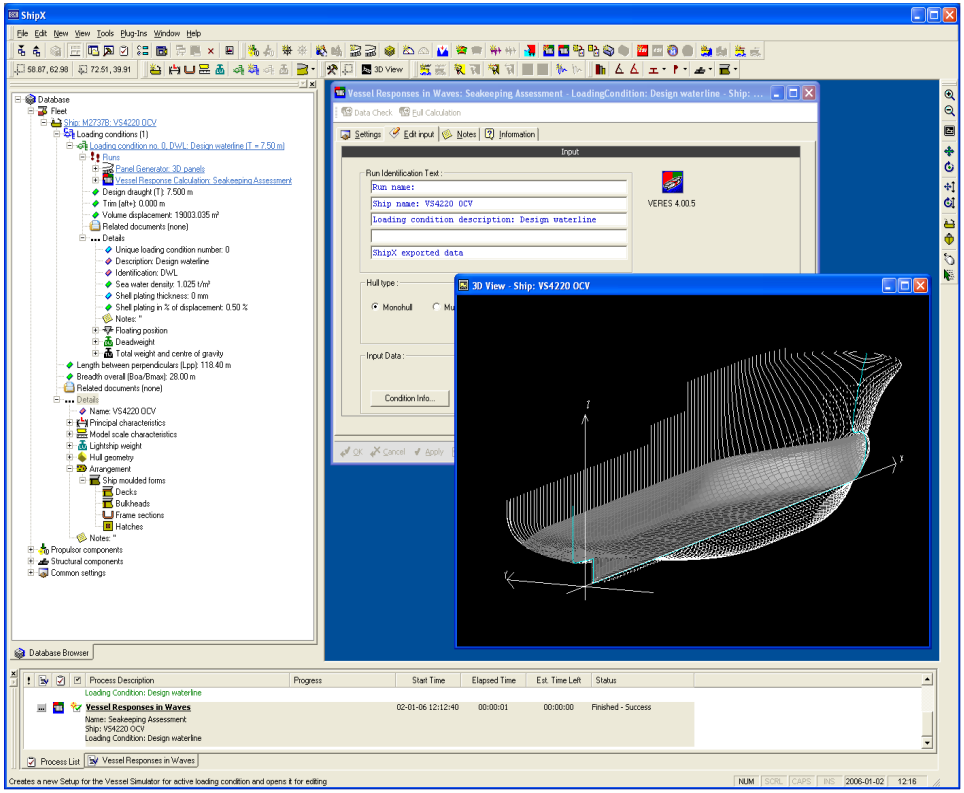
BECKER – CROSS OVER RUDDER

Vessel simulator VeSim

- A framework for time-domain simulations of vessel performance in a seaway
- Virtual laboratory

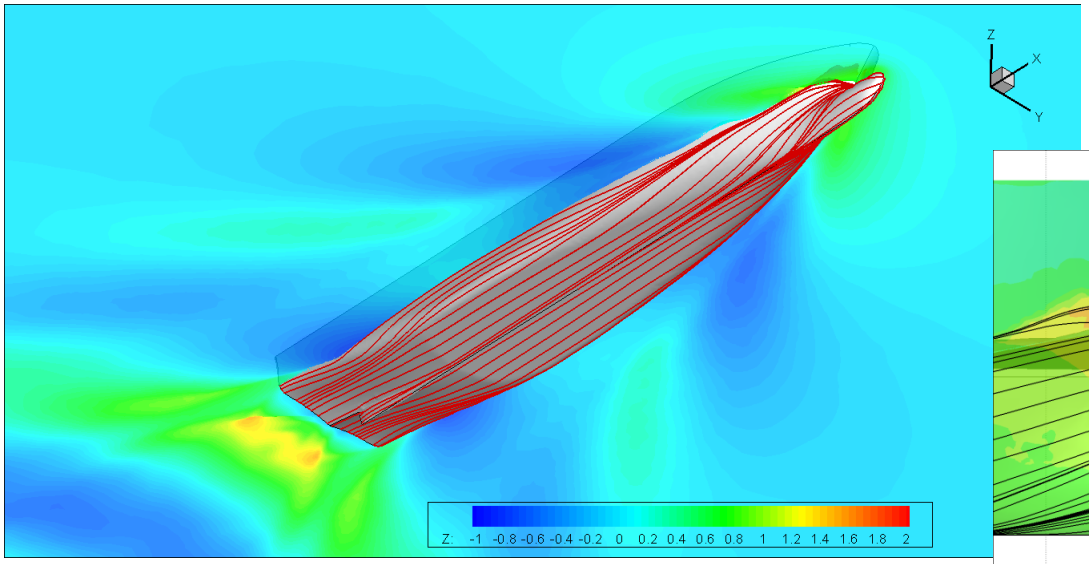


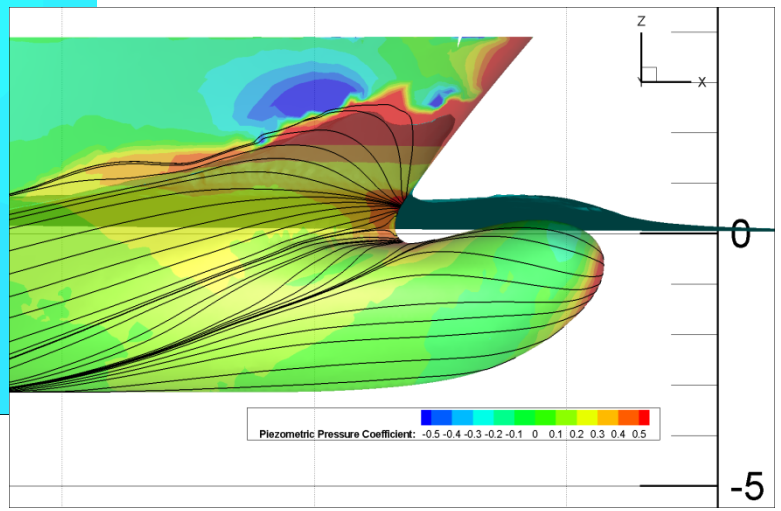
ShipX



- Engineering platform
- Main Plug-Ins:
  - Vessel Responses (VERES)
  - Station Keeping
  - Ship Speed and Powering (speed prediction, speed loss in waves)
  - Maneuvering
  - Report generator for calm water testing in towing tank
- Ca 30 companies are users of the program

Ship Resistance and Hull Optimization





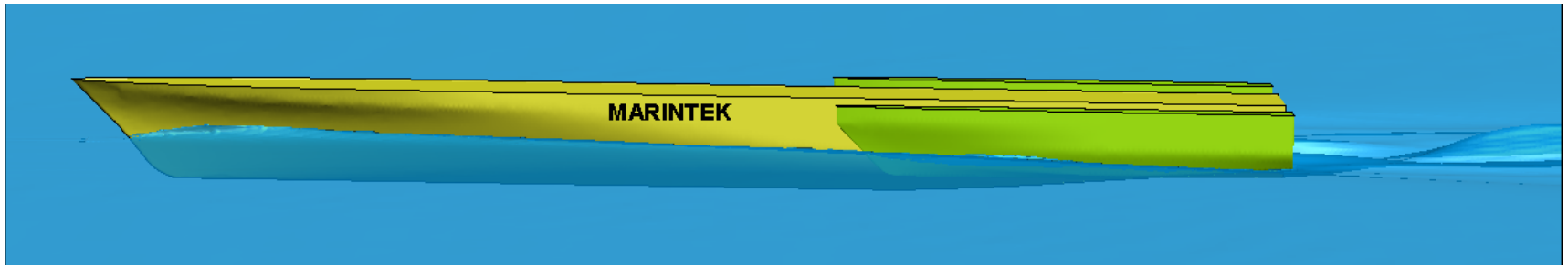
Va [knots]	15	16	17
Trim(*) [deg]	0.024645	-0.04616	-0.115051
Sinkage [m]	-0.197422	-0.236218	-0.274866
Resistance [kN]	133.396	184.977	242.200

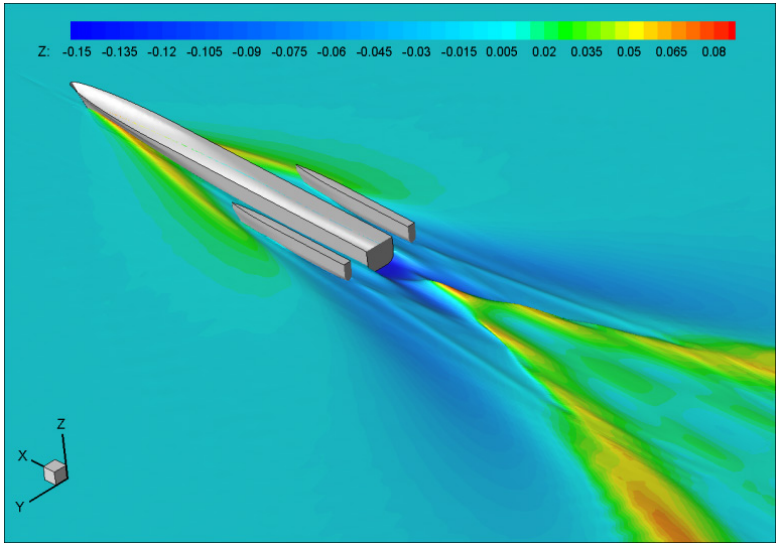
Vers.1

Vers.2

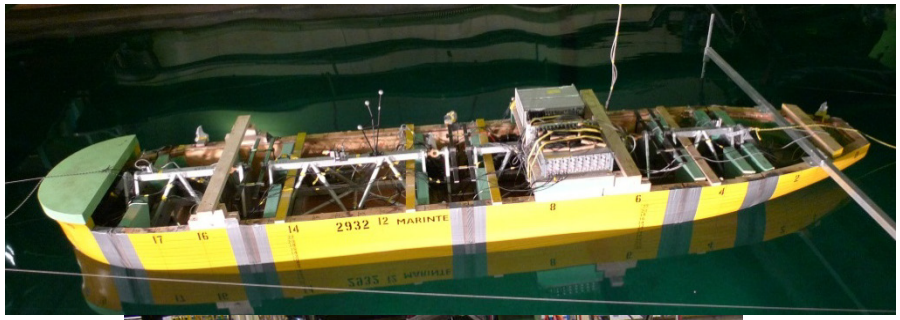
Va [knots]	15	16	17
Trim(*) [deg]	0.040877	-0.021985	-0.080824
Sinkage [m]	-0.204572	-0.241379	-0.279827
Resistance [kN]	133.069	182.332	224.529

Ship Resistance and Hull Optimization



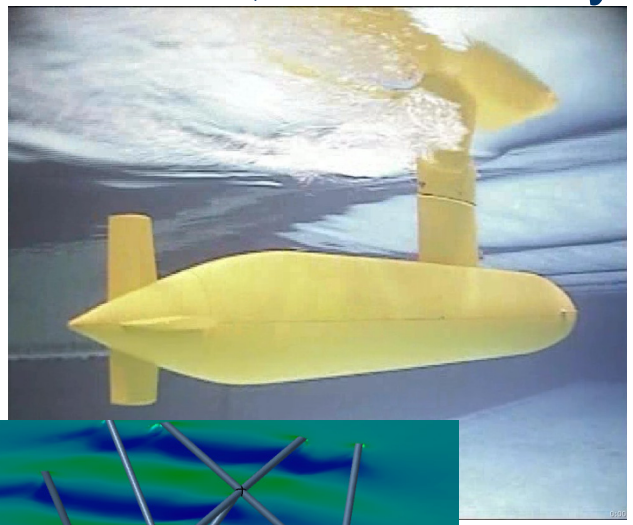


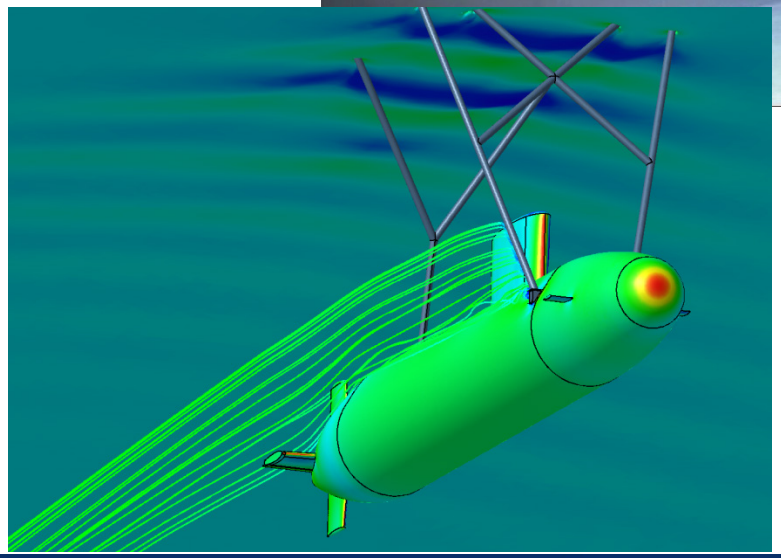
Hull girder loads – experimental methods



EDA Submotion II 2010 - 2014

- MARINTEK, Norwegian Navy (FFI), INSEAN, Italian Navy
- State of the art research project into submarine motion near boundaries
- Includes experimental, CFD and simulation research.

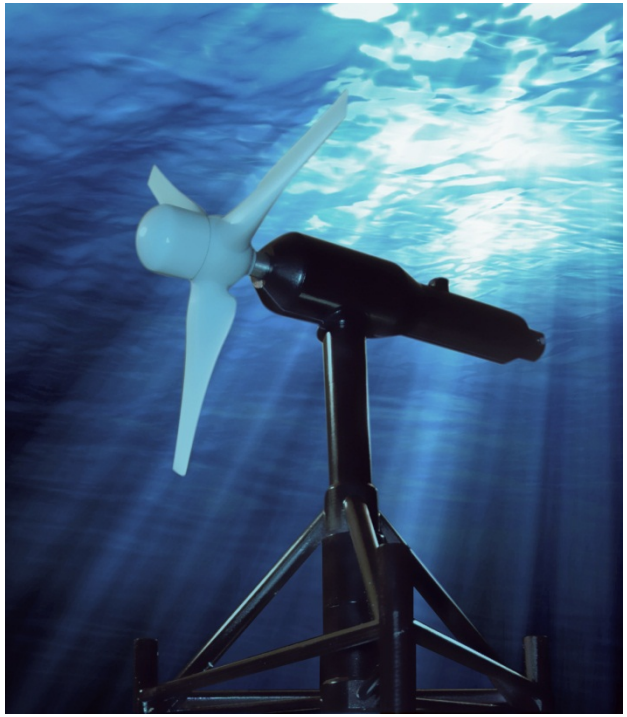




Tidal turbine investigation in extreme conditions

- MARINTEK, Statkraft, NTNU
- MARINTEK know-how on dynamics of propulsors in seaways applied
- Turbine and blade loading in extreme combinations of current and waves
- Unique data set for future design and operability studies

Loading and flow investigation of tidal turbine



- MARINTEK, Tidal Generation Limited (TGL), Rolls-Royce Plc
- Investigation their hydrodynamic performance including interaction between rotor and foundation
- Particle Image Velocimetry (PIV) applied to document the detailed flow around and in the stream of the tidal turbine
- Measurement of rotor torque and total thrust

Deep insights – High ambitions

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