Caterpillar Marine

BUILT FOR IT.

Caterpillar Propulsion

Emil Cerdier

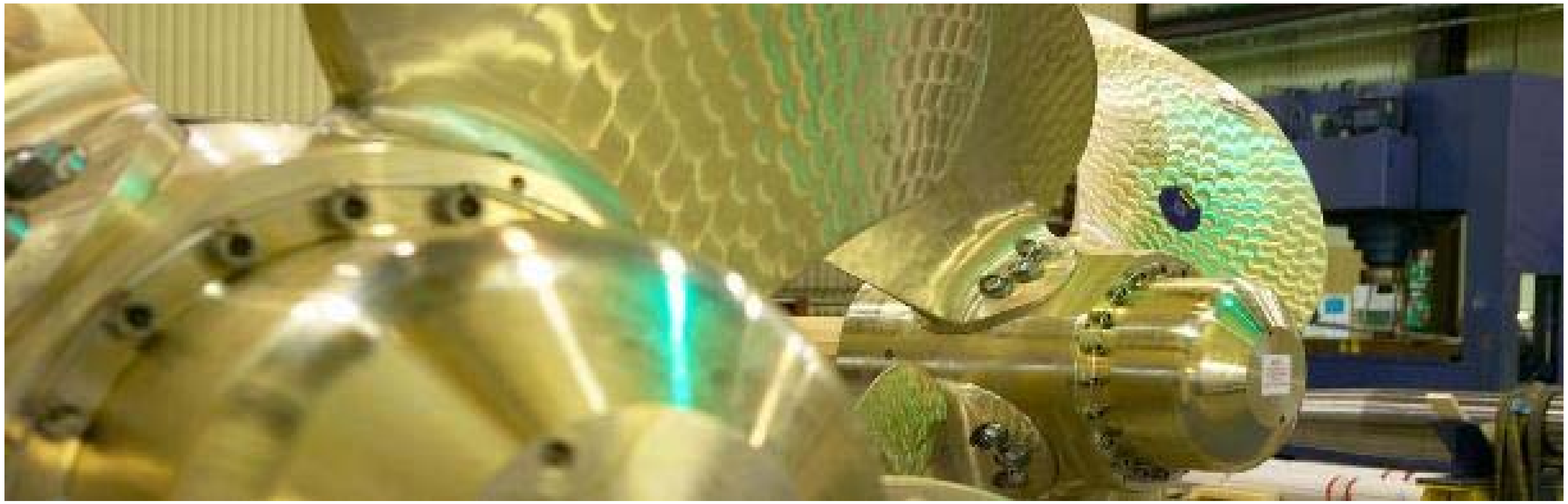
Sales Manager - Americas

MaK

CAT

Caterpillar Propulsion

- Former BERG Propulsion started in 1912
- Controllable pitch propulsion 1929
- Over 6000 propulsion units delivered



Caterpillar Propulsion Facilities

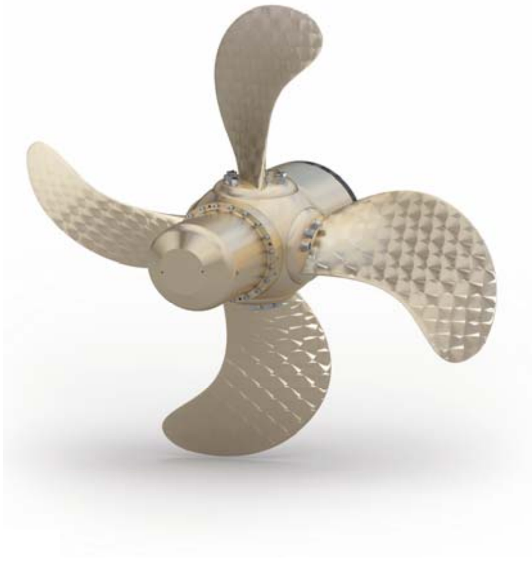
Headquarters, Sweden

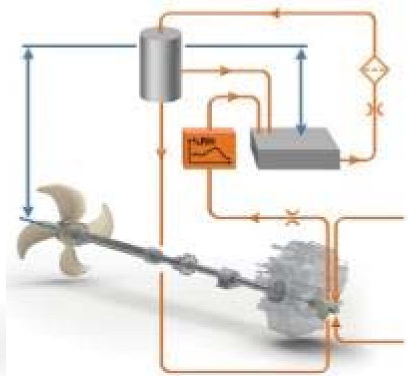
New sales production, Sweden

New sales production, Singapore

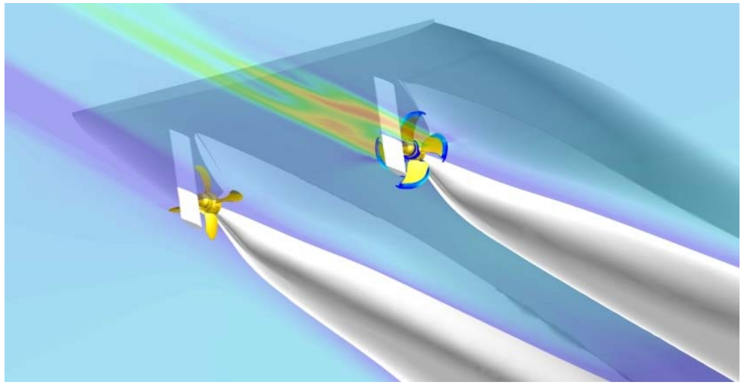
Aftersales production Sweden

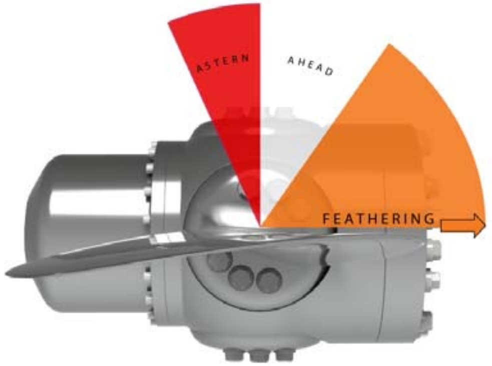
Caterpillar Propulsion
-one of the world´s leading propulsion manufacturers





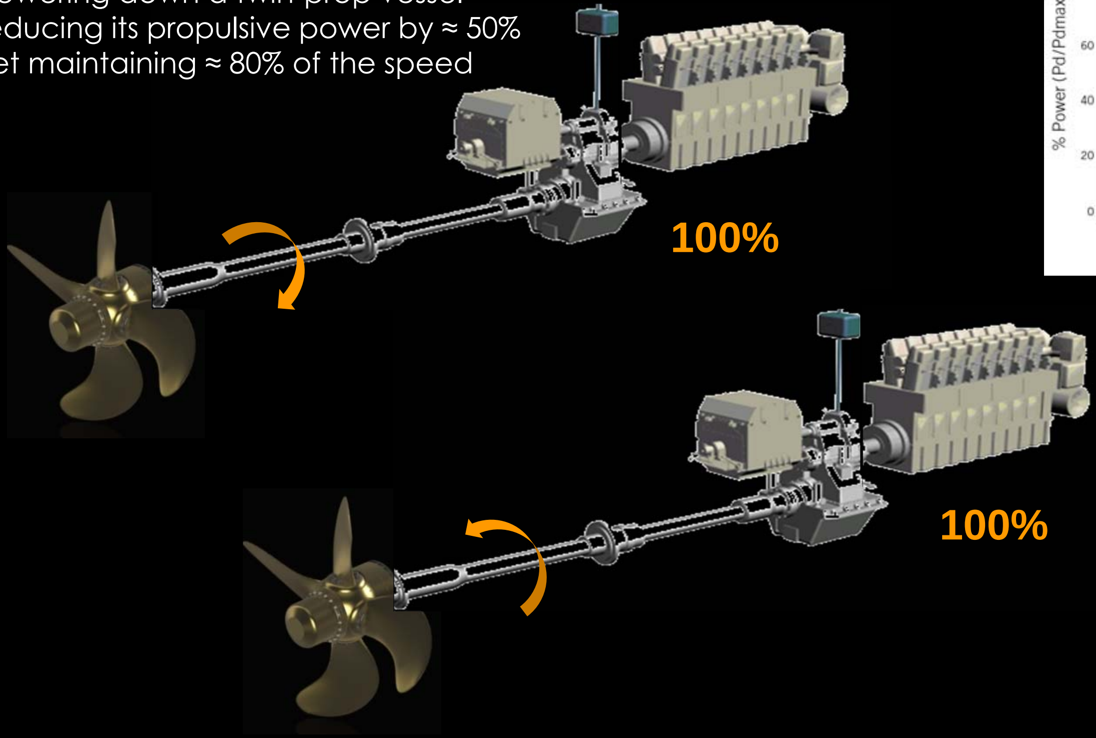
EXPERIENCE AND HYDRODYNAMIC EFFECTS OF OPERATING TWIN SCREW VESSELS WITH FEATHERING PROPELLERS DURING SLOW STEAMING

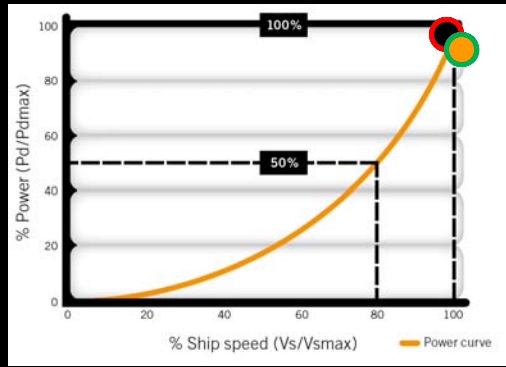


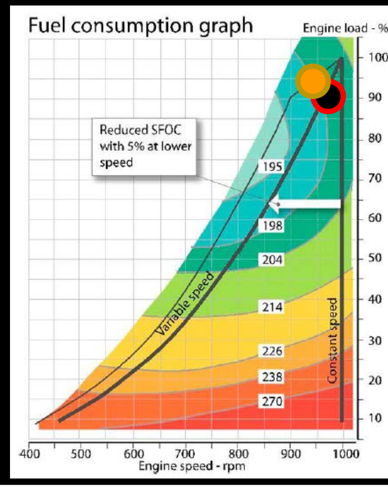


Propulsion Concepts – Slow Steaming

Slow Steaming – The concept of powering down a twin-prop vessel reducing its propulsive power by ≈ 50% yet maintaining ≈ 80% of the speed

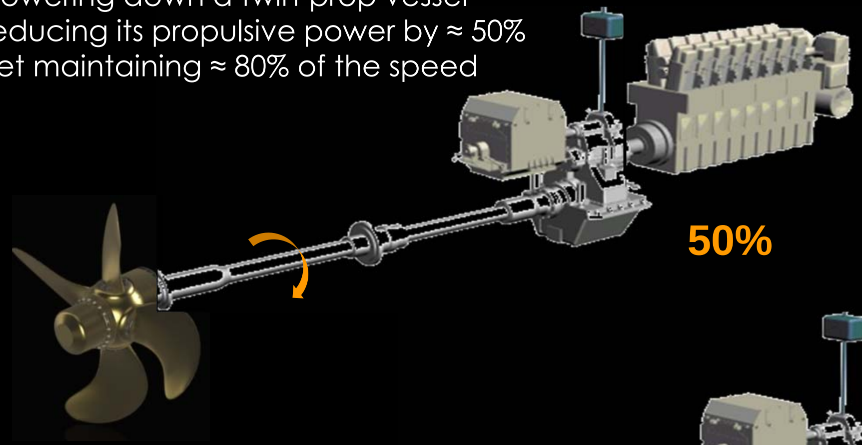


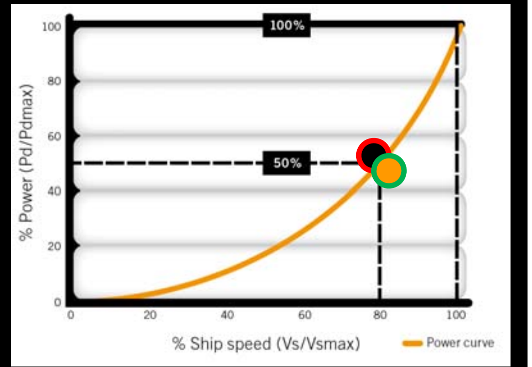




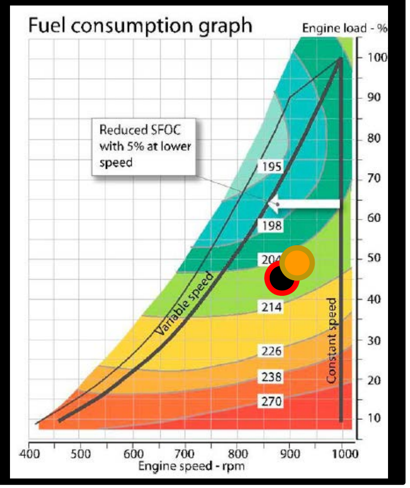
Propulsion Concepts – Slow Steaming

Slow Steaming – The concept of powering down a twin-prop vessel reducing its propulsive power by ≈ 50% yet maintaining ≈ 80% of the speed



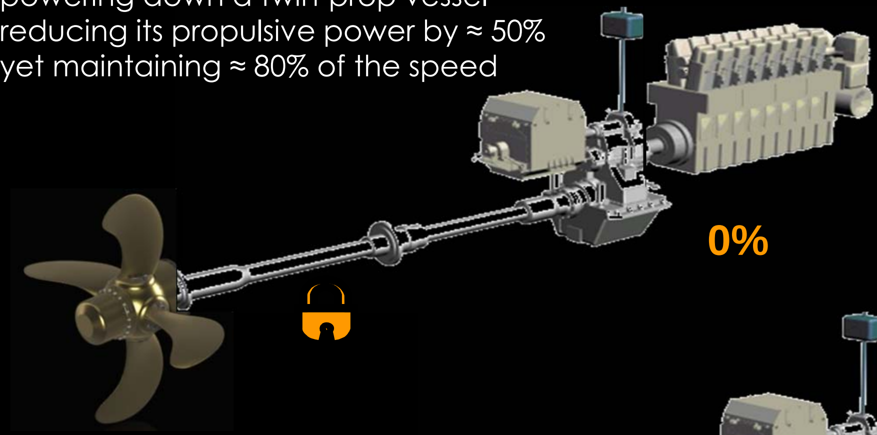


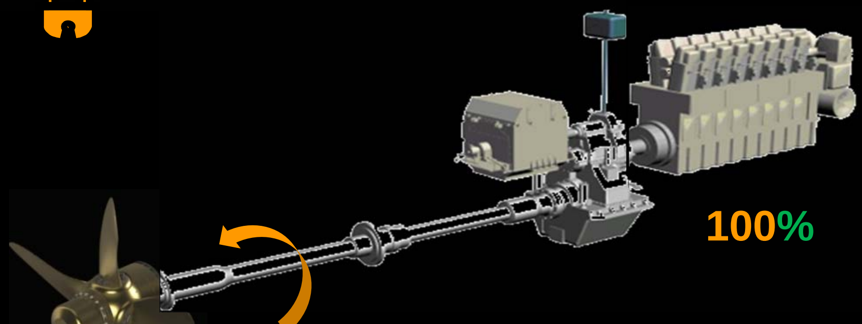
Conventional Approach – Powering down to 50% on both engines



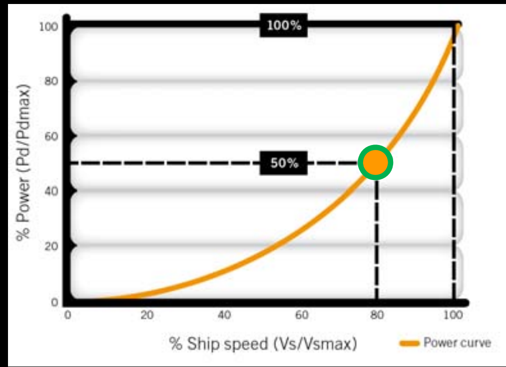
Propulsion Concepts – Slow Steaming

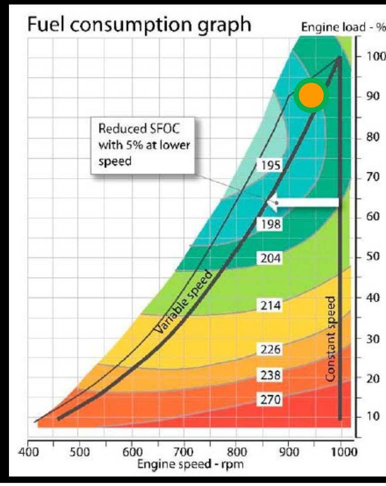
Slow Steaming – The concept of powering down a twin-prop vessel reducing its propulsive power by ≈ 50% yet maintaining ≈ 80% of the speed



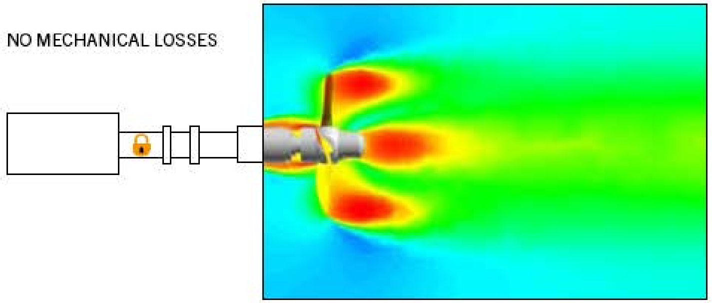


BERG Feathering – Shutting down one shaftline, allowing the other to maintain 100%!

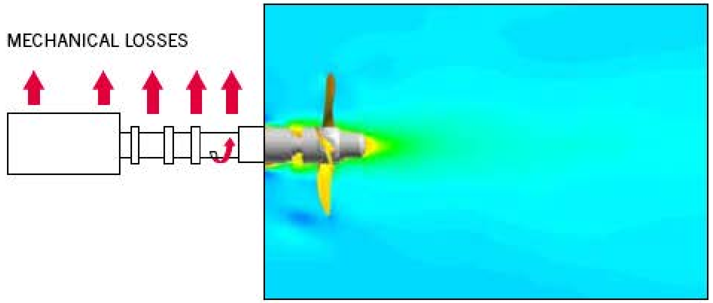




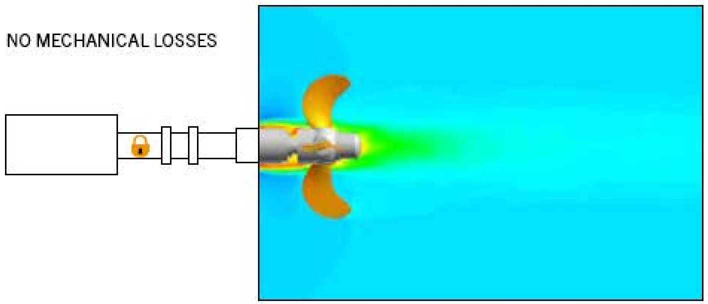
Feathering minimizing drag and resistance



Locked propeller shaft with full pitch ahead.



Self-milling.



Locked propeller shaft with feathering.

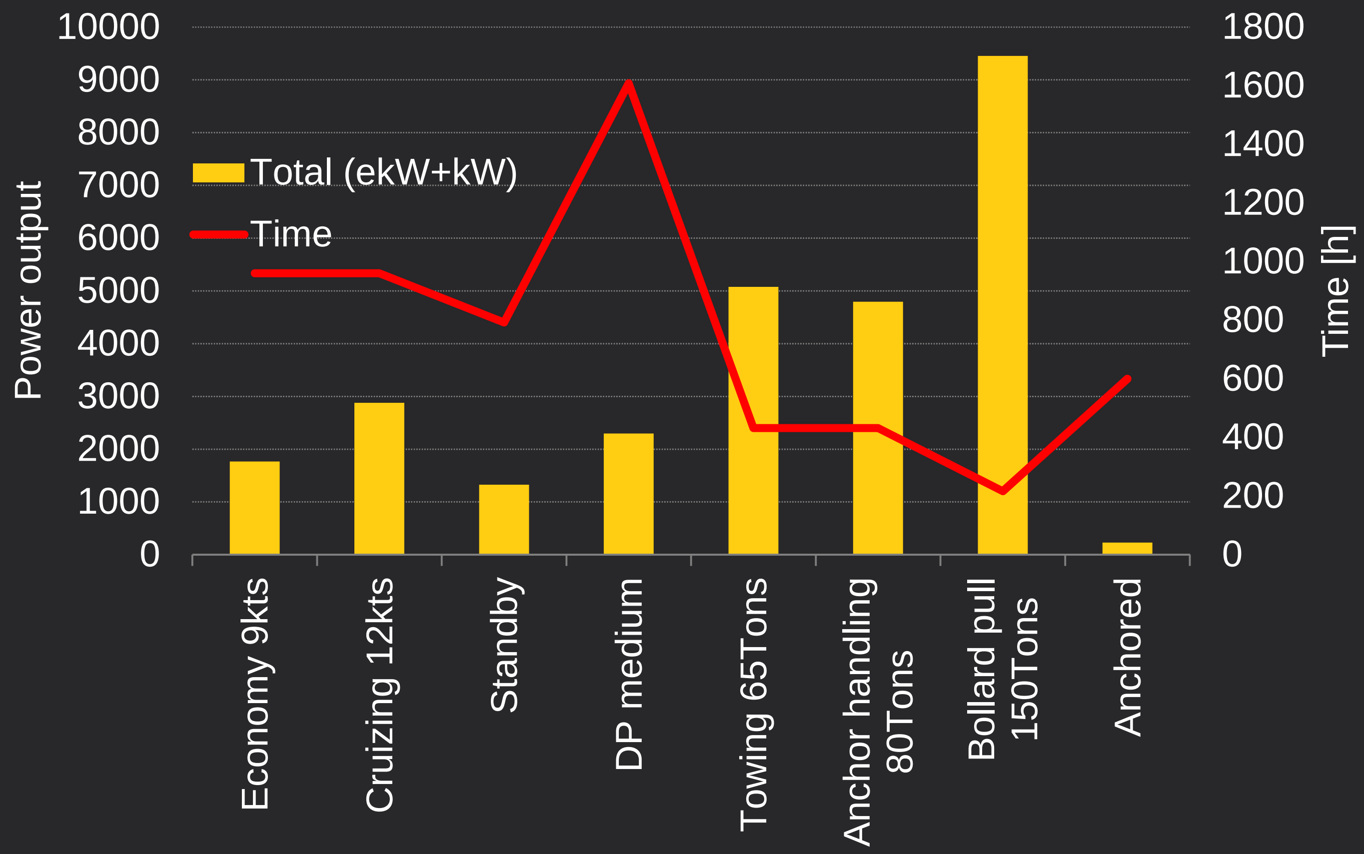
CURRENT POWER AND PROPULSION CRITERIA

Equipment selection focused on contractual requirements:

- Bollard pull
- Sea trial speed

But these meet only some of the operational requirements, and just a small percentage of the operational time.

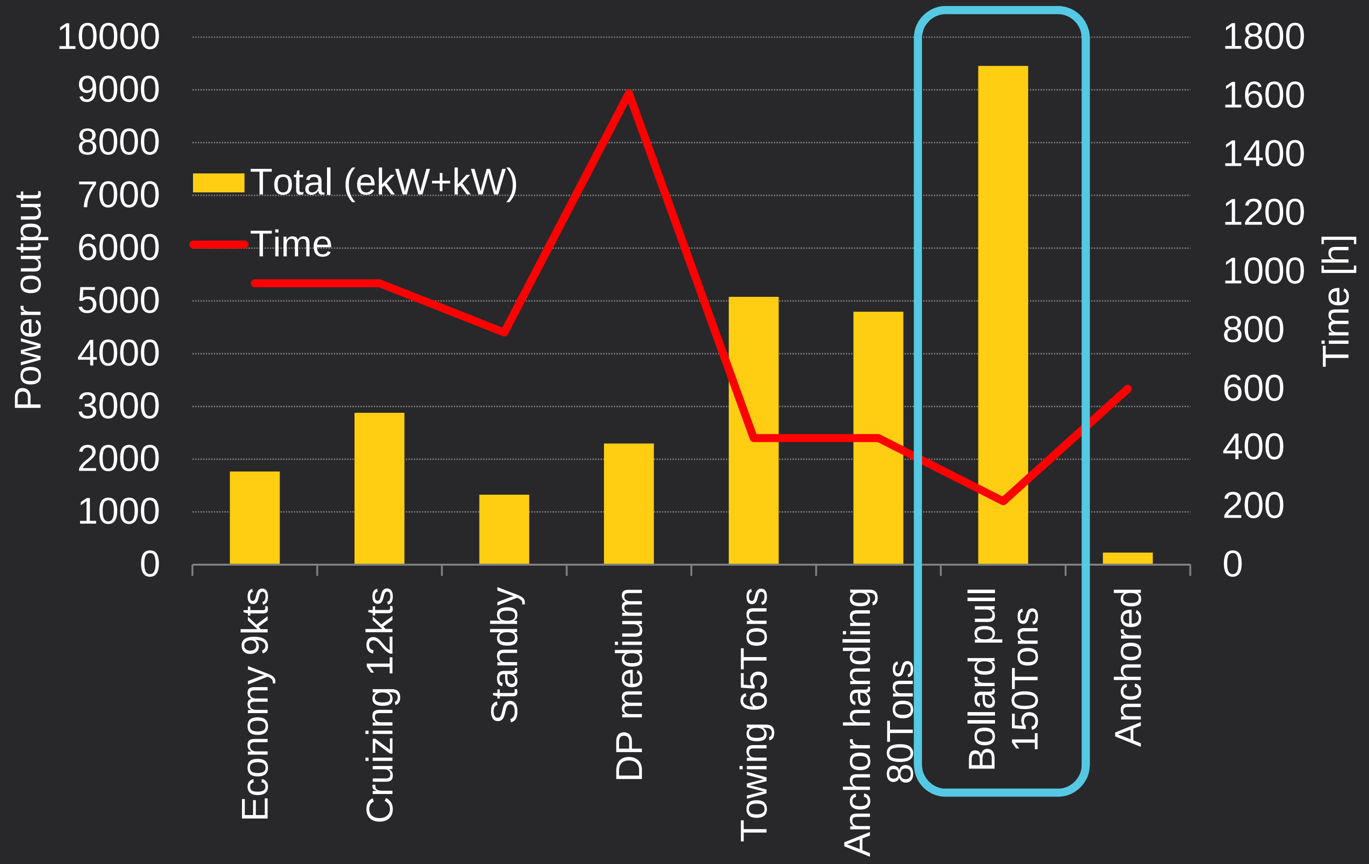
AHTS OPERATIONAL PROFILE



IS THE DESIGN OPTIMIZED?

Full power bollard pull

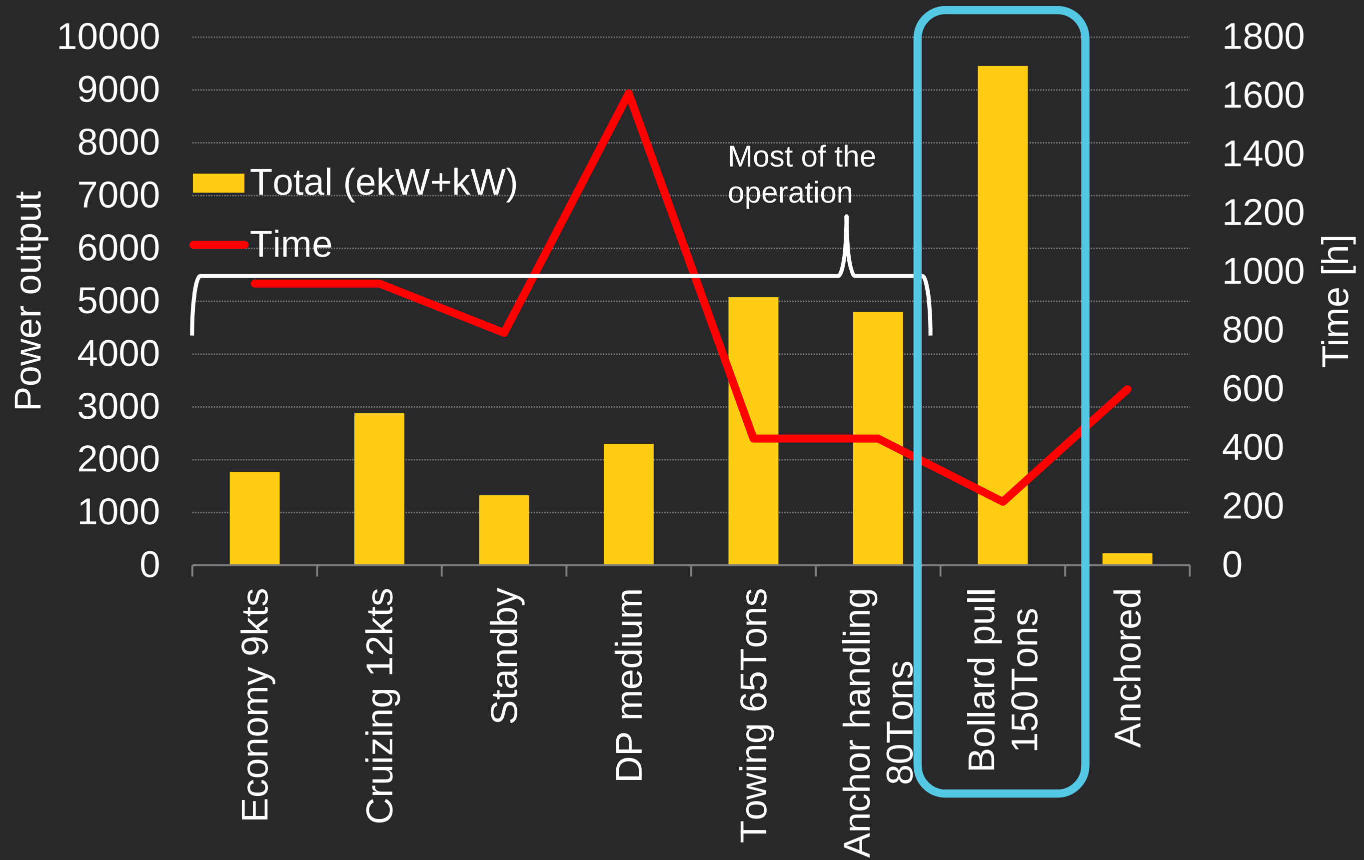
- Only 3% of the time
- Only 5% of fuel costs



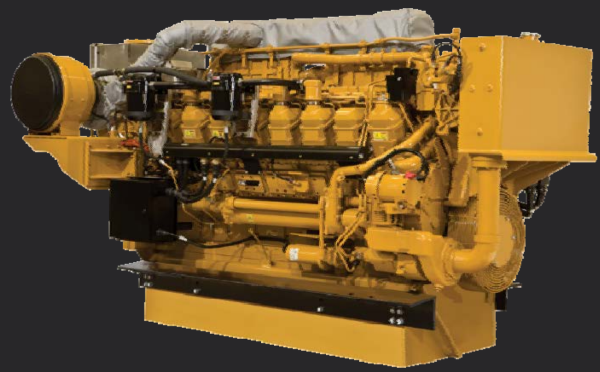
IS THE DESIGN OPTIMIZED?

Full power bollard pull

- Only 3% of the time
- Only 5% of fuel costs

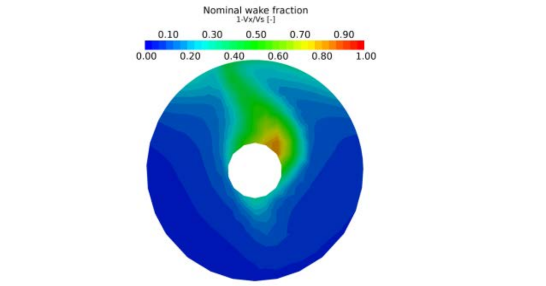


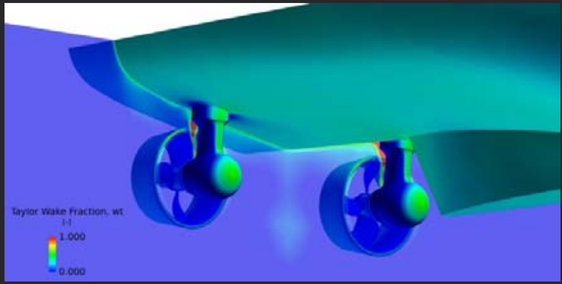
BUILDING BLOCK 1: ENGINE DATA

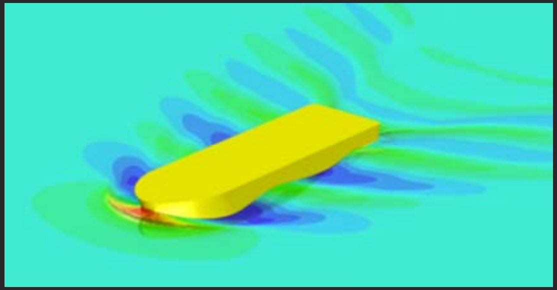


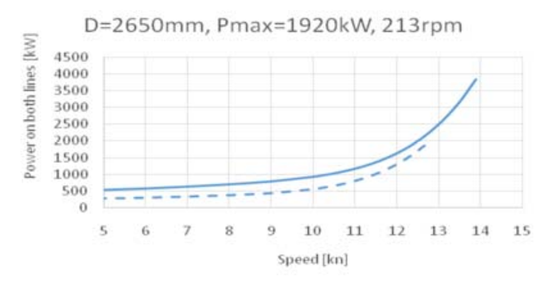
Example: Two engines with approximatly the same power output

BUILDING BLOCK 2:
PROPELLER/HULL INTERACTION





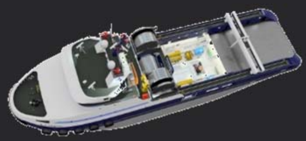




REQUIREMENT BASED PROFILE: METHODOLOGY

Caterpillar's Efficiency Workshop tool streamlines this benchmarking

12kts +



+

+

=

Cost of ownership
Fuel
Maintenance
Performance
Initial Cost

OPERATIONAL REQUIREMENT

RESISTANCE PROFILE & DATA

PROPULSION SOLUTION

POWER SYSTEM


CASE STUDY

INTRODUCING THE TEST SUBJECT: 160T AHTS

Operational mode	Requirement	Time
Economy Speed	9kts	6%
Cruising	11kts	18%
Fast Transit	13kts	6%
Standby	2kts current, 5kts wind speed	20%
Dynamic position	2kts current, 10kts wind speed, DP2	20%
Towing	5kts speed, 70T force	9%
Anchor handling	2kts, 110T pull, 20T tunnel thrusters	6%
Anchored	Hotel load	15%

Requirements

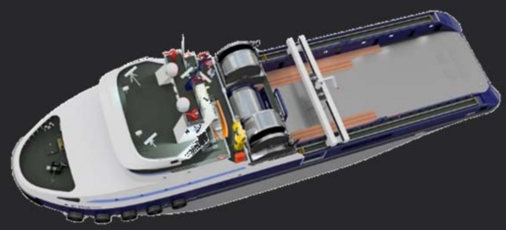
Min 160T Bollard Pull

13kts speed

75m

DP 2

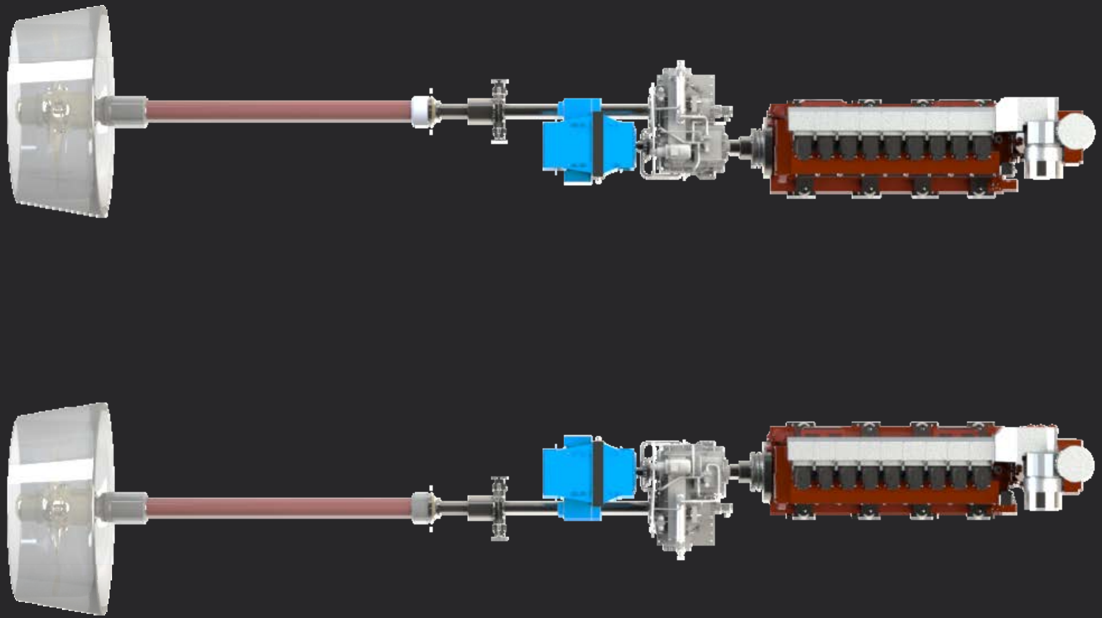
8000h/year



STANDARD DESIGN

160T AHTS

- 2 x MaK 9 M 32 C engines @ 4500kW
- 2 x 4.2m main CP propellers

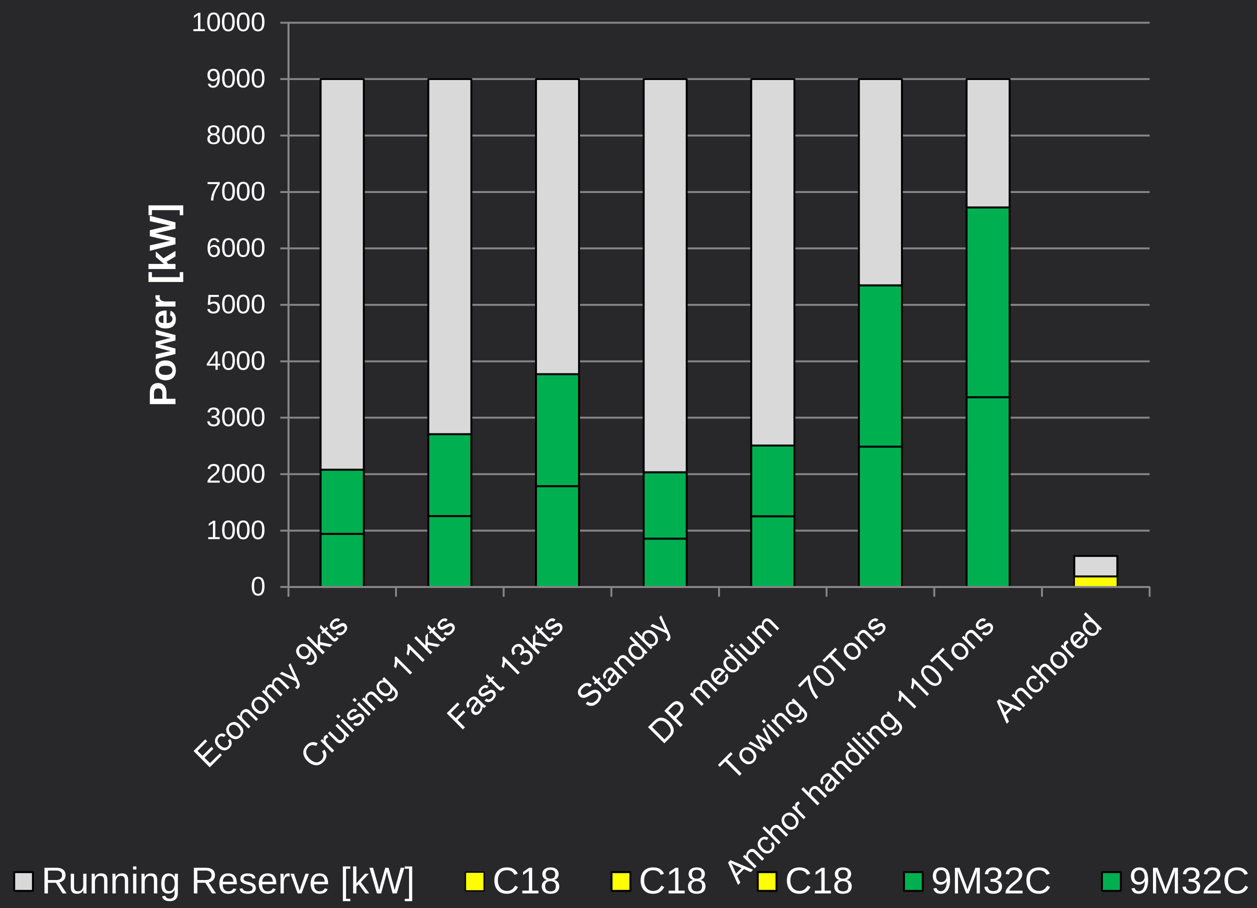


STANDARD DESIGN

Transit and standby mode

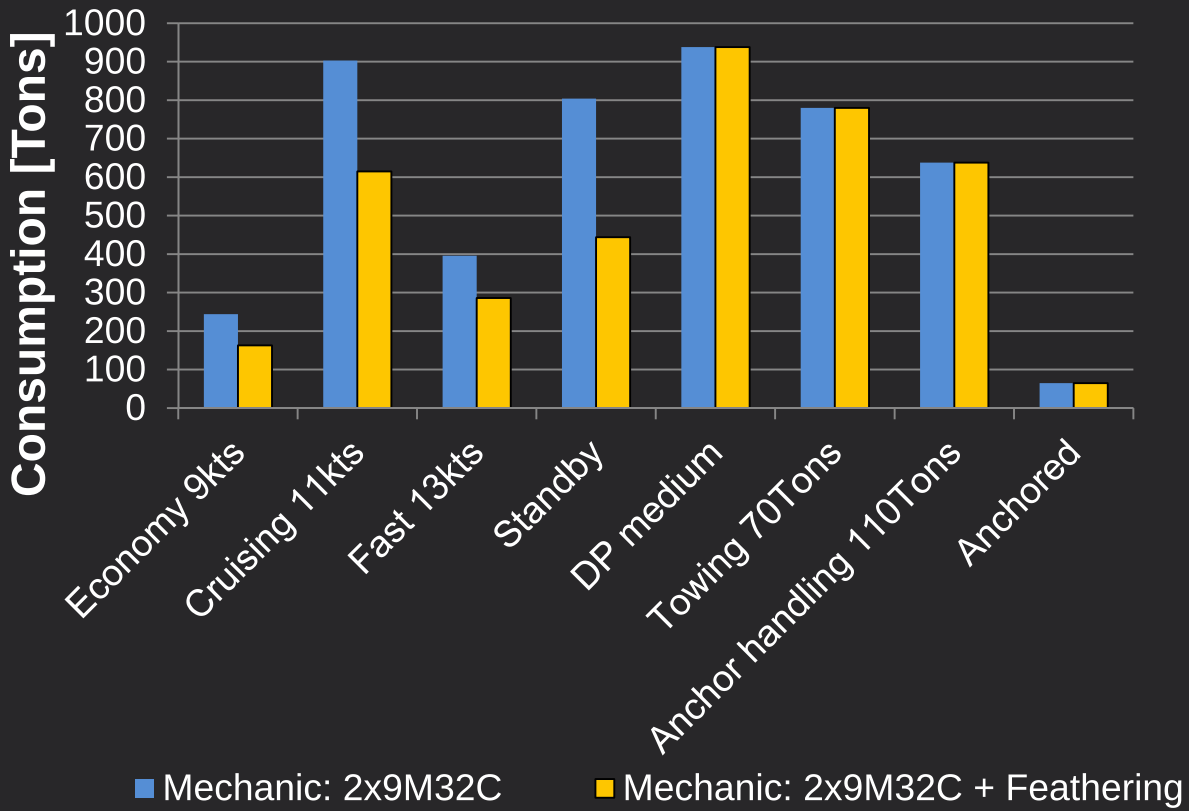
- 50% of the time
- 48% of fuel costs

Both engines used but inefficient at 30% average load.



INTRODUCING FEATHERING

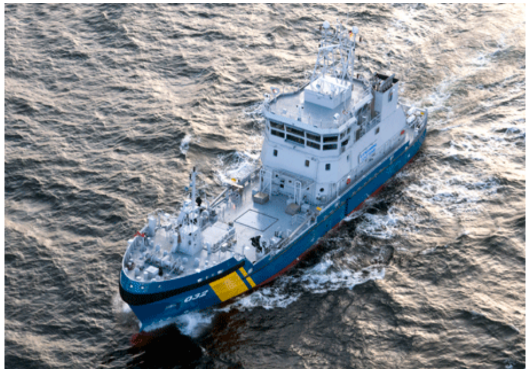
- 17% lower fuel costs
- 28% lower maintenance costs



CAT®

References

Heavy Lift Vessel



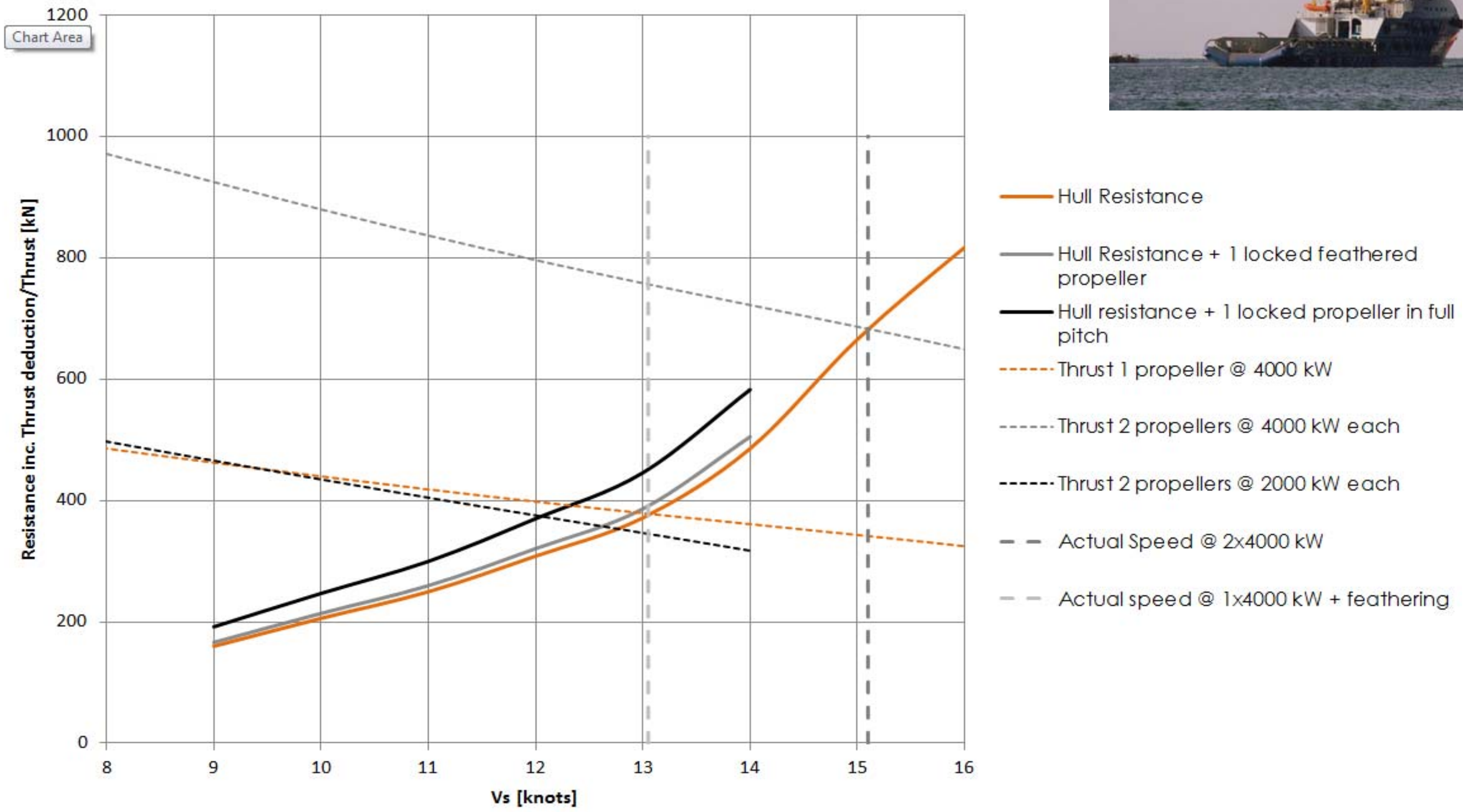
Patrol Boat

Nuclear Fuel Carrier

AHTS

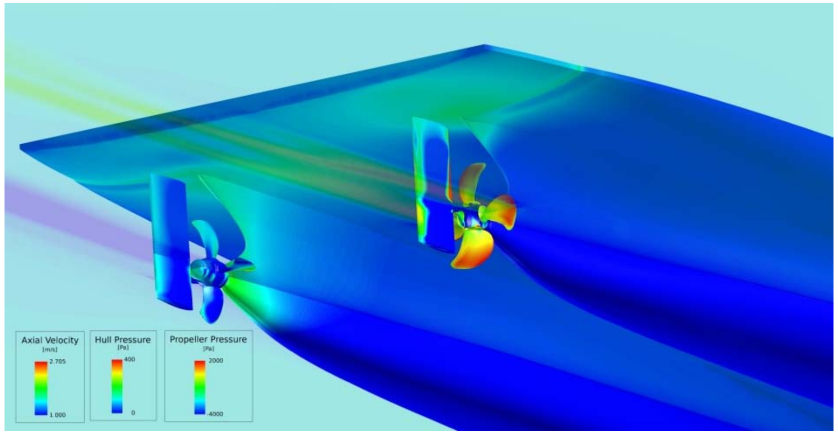
+ Product and Chemical tankers, sailing yachts, RO-PAX ferries, Tugs and more.

Sea Trial Test



Main Conclusions

- Feathering can be applied to any vessel with more than one propulsion unit and with controllable pitch propellers
- Feathering increases efficiency and flexibility
- Caterpillar Propulsion has a large Reference list with feathering MPP



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 நன்றி