Aker Arctic Conference 15.02.24

Think Small! Icebreaking for a greener future

EAS
Enterprise Estonia

The journey so far

2020 – first prototype

2021 – testing in Norway

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2022 – established company in Estonia

2023 – development and model testing

2024 – second prototype

2024 – testing in Estonia. Modifications.

BIFROST TUG

Second prototype
Sea trial 16. jan 24

Liam i Hasle med en aftagelig isbrydende stævn. Foto: Mikael Vang

Torben Østergaard Møller
Journalist

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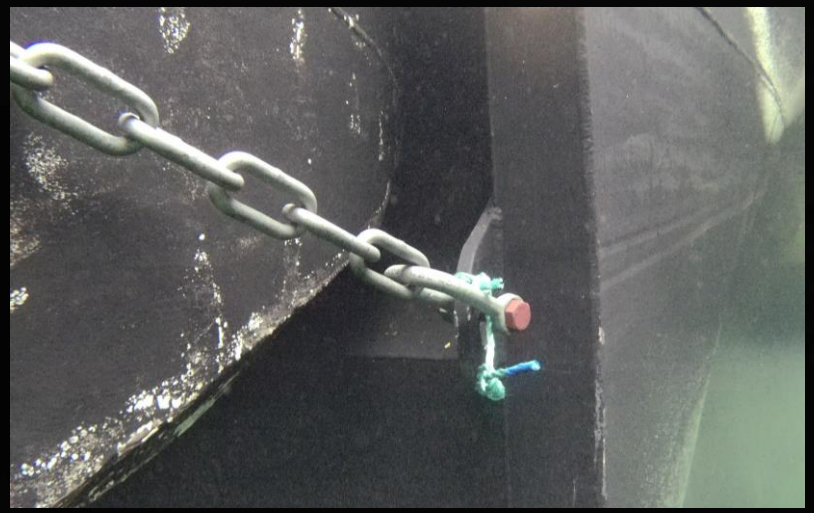
- The bow was produced at Fitjar Mekaniske
- A one-week journey to get to Estonia
- 6 m waves

The concept

- Detachable floating bow for tugs
- Easy to mount/demount
- The channel is wider than the width of the ship; 13 m
- We aim to break up to 60-70 cm of ice, 500 kW
- The midpart is hydraulic to be adjusted to the thickness
- Market: harbour tugs, windfarms, fishfarms
- Can be scaled up and also used on larger ships

TUG



BIFROST TUG

The think small concept

- Icebreaker and tug fleet are old in the Nordics and the Baltics
- Now is the time to develop new concepts to fit to a modern icebreaker fleet
- Sustainability - We must explore other possibilites than just changing the fuel

BIFROST TUG

Preliminary results for construction costs for different design options of the Estonian icebreakers

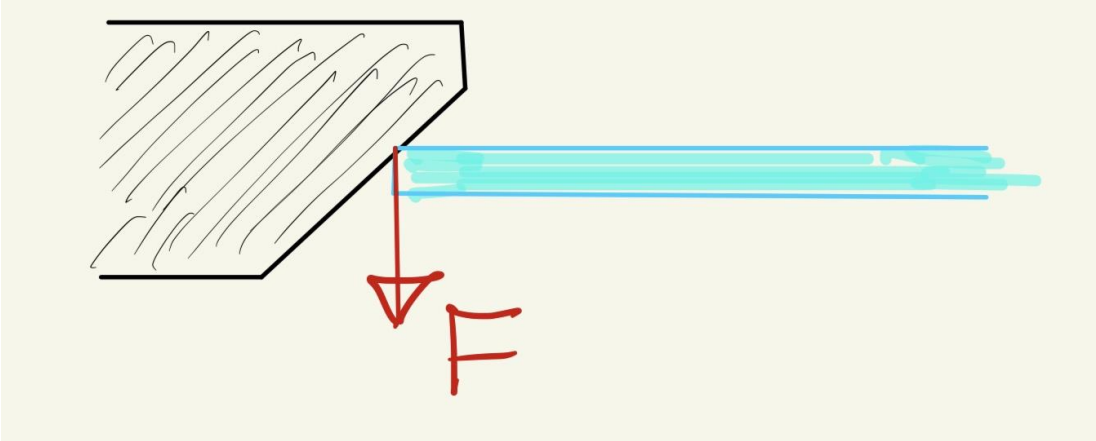
Table 38. Estonian Icebreaker design options and price estimations

Parameter	*Gulf of Riga*		*Gulf of Finland*		
	Icebreaker	*Tug + Detachable bow*	*Primary IB*	*Secondary IB*	*Third IB*
Breadth, m	**16**	**16 (bow)** 12 (tug)	**24**	**24**	**18**
Design draught, m	4.5	4.5	7.5	7.2	6.0
Length (DWL), m	54	40+18	90	86	62
Depth on main deck, m	6.0	6.0	11.0	10.5	8.5
Lightweight (est.), t	1600	1050+750	5700	4900	2500
DWT on design draft, t	700	200	3000	3000	1500
Type of propulsion	2 Z-drive propeller units	2 Z-drive propeller units	2 electrical / Z-drive propeller units	2 Z-drive / electrical propeller units	2 Z-drive propeller units
Propulsion power, MW (estimated)	4.4	4.4	10	7	5
Total ME power, MW (estimated)	5.1	5.1	13	9.1	6.2
Service speed, kn	12	11	14	13	13
Construction cost estimation, million EUR	**40**	18 + 8 = 26	**100**	**85**	**50**
Crew (min)	12	8	20	18	16

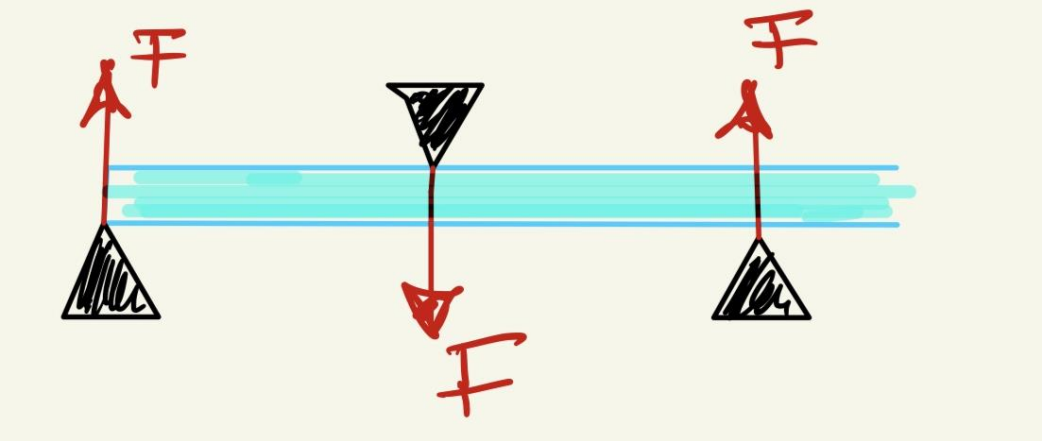
Source: TalTech report: Analysis of alternatives for providing icebreaking services in Estonia, oct. 23

- Add icebreaker bows to existing harbour tugs
- Build smaller tugs and bows
- Multi purpose use is important

MAIN PRINCIPLE



Resultant vertical force ~F



Resultant vertical force ~0

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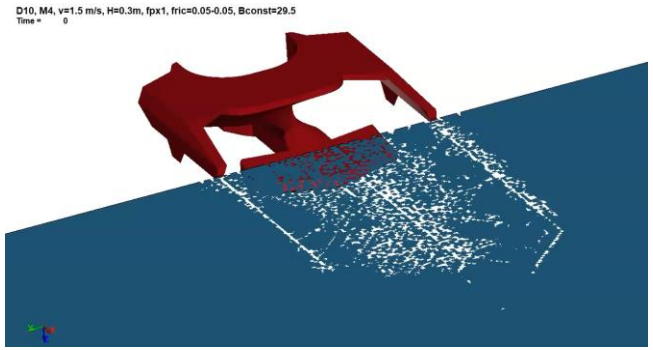
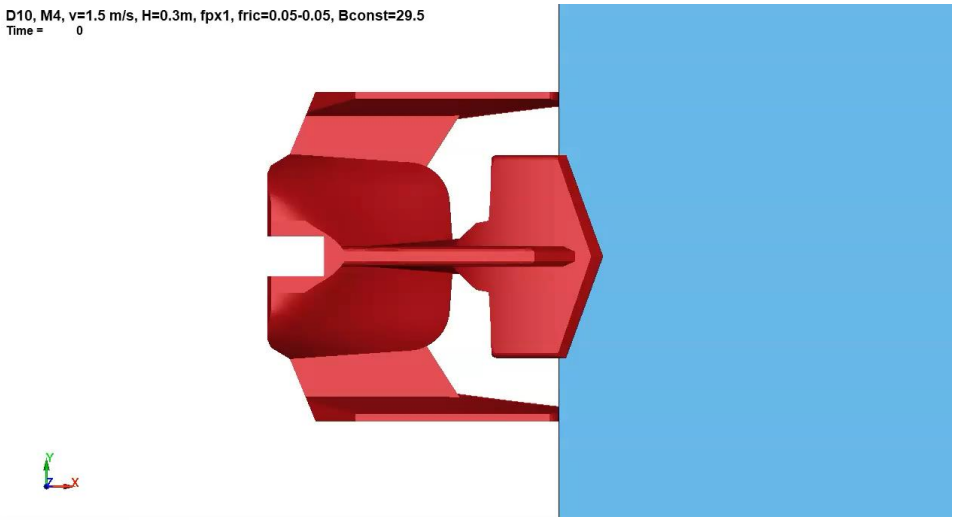
SIMULATIONS & MODEL TESTS





TAL TECH

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ICE IDENTIFICATION SETUP

IMAGE CLASSIFICATION – NEAR FIELD ICE DETECTION

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- Images captured using stereo camera 1024 x 512 resolution
- Captured a large dataset including
  - Broken ice
  - Floes
  - Overlaps / Ridges

Next step

- Finish testing
- Development of ice detection system
- Reconstruct
- Soon ready for commercial service

Thank you for listening!

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