



Motorized Detachable
Icebreaking Bow

**Patented cost-effective
solution that transforms
ice strengthened vessels
and tugboats into
icebreakers**

DIBB is an invention designed to improve the cost-effectiveness and environment friendliness of icebreaking operations. For icebreaking, DIBB is connected in combination with a separately selected pusher. The pusher vessel can be used for other work tasks when there are no ice conditions. The savings achieved this way are obvious.

DIBB's propulsion solution guarantees the combination excellent maneuverability in ice. It is a very important feature in escort icebreaking, which, first and foremost, means assisting other ships.



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Capable of breaking 12.6m width channel
up to 70 cm (28 inch) thick level ice.



	DIBB Saimaa	ASD Tug Calypso	Combination
Length	25.3 m	25.86 m	40.8 m
Breath max.	12.6 m	8.94 m	12.6 m
Draught	3.4 m	3.0 m	3.4 m
Displacement	415.61 tons	338.54 tons	754.15 tons
Installed power	1590 kW	2349 kW	3939 kW
Propulsion power	2 x 600 kW	2 x 700 kW	2600 kW
Speed		12.1 knots	11.8 knots
Speed at 0.7 m ice			4 knots
Speed at 0.4 m ice			8 knots
Speed at 1.5 m consolidated channel			8 knots
Ridge behavior			Good
Ice class	Modified 1A Super	1A	Modified 1A Super
Bollard pull	12.5 tons	16,7 tons	29 tons
Crew	0	5	5
Endurance	14 days	14 days	14 days
Flag	Finland	Finland	Finland
Year Built	2020	2004	2020
Classification	LR Acceptance in compliance to requirements	DNVGL +1A1 TUG ICE (1A) R1	LR Acceptance in compliance to requirements

- Concept and basic design for the DIBB was developed by **ILS Ship Design & Engineering**
- Ice model tests carried out by **Aker Arctic**
- DIBB builder **Turku Repair Yard (member of BLRT Group)**
- DIBB owner is **Finnish Transport Infrastructure Agency**
- DIBB operator is **Alfons Håkans**



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Co-financed by the European Union
Trans-European Transport Network (TEN-T)



Excellent manoeuvrability

The hull form of the bow have big flare angles which are acting like bow reamers.

Reamers increase the width of the ice channel, and thus reduce frictional resistance in the aftship, as well as improve the ship's manoeuvrability in ice.

“The benefit of the reamer propellers is that they are far from each other and therefore generate a big turning momentum when thrusting to opposite directions, which makes it possible to turn almost on the spot.

The big turning momentum produced by the reamer propellers applies also in turning tests as in breaking out of own channel.”

Aker Arctic A-539 Final Report

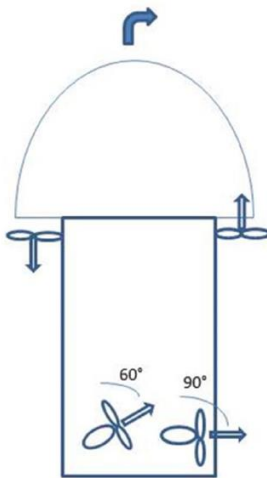


Figure 4-3 Test 2-7

Breaking out of own channel

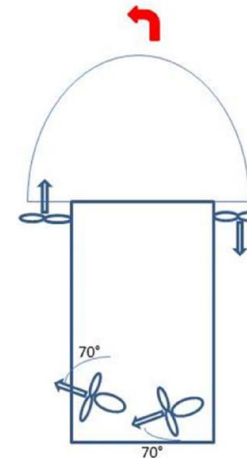


Figure 4-5 Test 4-2

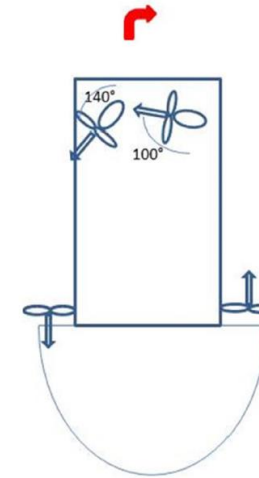


Figure 4-6 Test 4-3

Turning on spot



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Sailing area:

Lake Saimaa and coastal areas cat. 1 (3 nm from coast) in Finland's coast of the Baltic Sea

The DIBB comprises the following main components:

Hull:

- DIBB's hull form is optimized for icebreaking tasks in Lake Saimaa.
- DIBB's notch is designed for the tugboat Calypso and can be adapted to other similar tugs with modifications.
- The DIBB's notch is shaped so that ice cannot get between the hulls.
- The DIBB's ice strengthening is based on the combined immersion of the combination and the 1400 kW engine power of the tugboat.

Hybrid Diesel-Electric Propulsion System

- Main diesel generators 2pcs, generator power 760 ekW, possibility of cross-feeding
- Small auxiliary diesel generator, power about 70 ekW
- 2 fixed blade propellers, shaft lines, thrust bearings and propeller motors 2 * 600 kW, direct drive without reduction gear

Auxiliary Systems:

- Daily fuel tank and storage tank with the possibility to connect the fuel system flexibly to tugboat's fuel system.
- Box cooler cooling for diesel generators, frequency converters, propulsion electric motors.
- Hot water boiler for DIBB's heating
- DIBB's de-ice systems (defrosting and air bubbling, notch defrosting)
- Fire extinguishing, CO₂, drainage, etc. systems



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Electric Installation

- The electrical system of the hybrid diesel electric machinery, including the main switchboard (DC) of about 700 V, frequency converters, brake resistors, supercapacitor, control units, UPS, generator automation.
- 400 V / 230V electrical system (AC) for DIBB's other devices, including electrical switchboards, transformer. In normal use, supply from DIBB's DC switchboard to the 400V switchboard. There is also connection to tugboats power supply, to DIBB's auxiliary diesel generator and to shore power supply
- Remote camera surveillance and remote alarm system for surveillance

Deck Equipment:

- Floodlights, deck lights
- Dipped-beam headlamps
- Anchoring and fastening equipment

During the shore connection, the following can be done in the DIBB:

- Heat the DIBB and the required systems with the boiler, heat pump and electric heaters
- Keep the machine monitoring (including remote monitoring and remote camera monitoring) enabled
- Keep the machines ready for use
- Test drive propellers at low power
- Keep the DIBB's electrical system and lighting on
- Operate fire and general alarm systems
- Operate the DIBB's fire and discharge / ballast pumps at the same time
- Use the CO2 system
- Use the de-ice systems

User Experience of Motorized Detachable Icebreaking Bow DIBB Saimaa

"Industry in the Saimaa region has wished for the extension of the current traffic season, as it has to resort to substitute transport when the canal is closed. Existing icebreakers cannot always assist merchant vessels effectively in difficult ice conditions. The detachable bow is able to break ice that is up to 70 cm thick.

The detachable bow, which will be attached to the tugboat, will significantly improve icebreaking in the Saimaa Canal, and the Finnish Transport Infrastructure Agency's aim in for ships to be able to operate in the Saimaa Canal nearly year-round in the future."

From Vayla.fi



Kari Wihlman,
Director-General of the Finnish Transport Infrastructure Agency



"I am satisfied with the operation, control, and functionality of the combination."

Calypso operates in Saimaa with a crew of five. Sometimes the assisted vessel has to be towed. This happens especially during extremely icy winters. Mooring is also usually facilitated by pushing away ice that has accumulated next to the dock.

There is little daylight in winter, and due to fog or snow visibility can deteriorate quickly even during the day. Sometimes you just have to stop for a moment and ride it out. The engine power of the vessels requiring assistance is often lacking. Any turns must be gentle so that cargo ships do not get stuck.

The bow and the tugboat are adjusted to the correct depth with ballast and attached hydraulically via three point hitch. Wires are connected as well. It all takes just ten minutes."

From VAPAAVAHTI 1/2021



Pekka Arasola, Calypso's Master



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