Aker Arctic

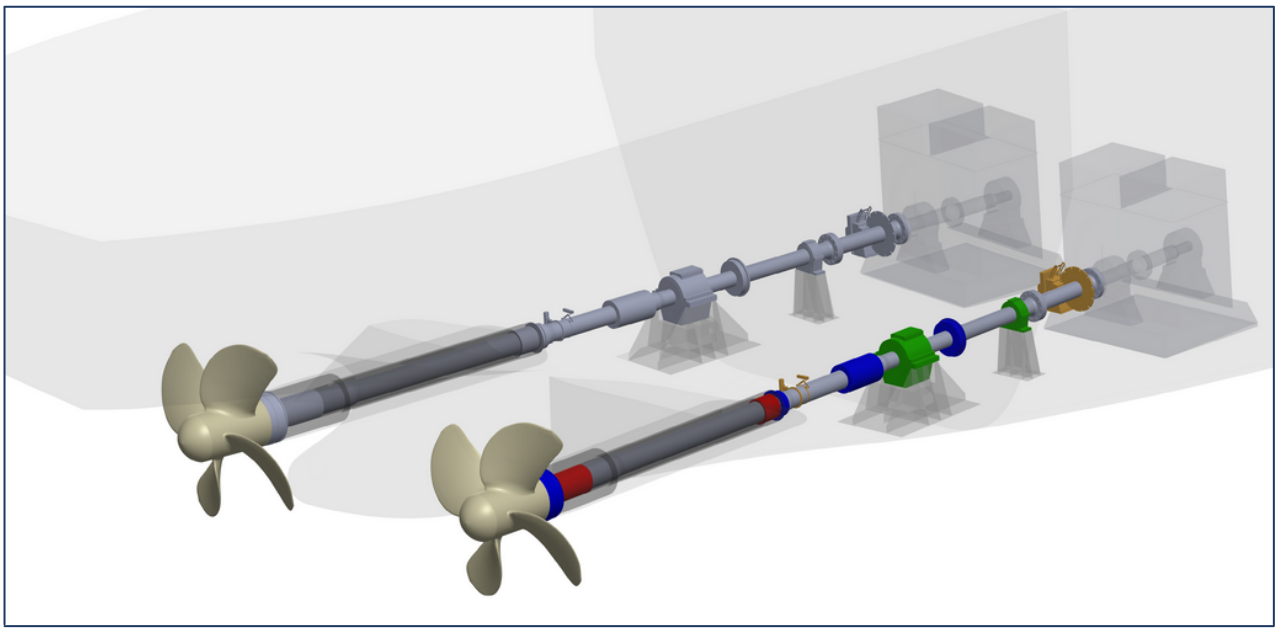
Propulsion Package Solution

Aker Arctic's propulsion package solutions ensure reliable, efficient shaft performance throughout the lifetime of the vessel.

Operations in ice are a challenging design scenario due to the large ice pieces interacting with the propeller. The propulsion system design must be a balance between strength and efficiency. Aker Arctic´s cost effective, durable propulsion solutions are based on decades of experience designing shaft lines for the ice-going vessels operating in all Arctic conditions.

Our scope of supply typically includes:

- Performance guarantee
- Design check of interface elements to propulsion shaft lines
- Classification and detail design of propulsion shaftline
- Fixed pitch propellers (bronze or stainless depending on the application)
- Shafts coupling
- Stern tube including bearings and seals
- Thrust and radial bearings
- Bulkhead seals
- Turning and locking device
- Shaft earthing device
- Rope guard and cutter, and
- Shaft line monitoring system.



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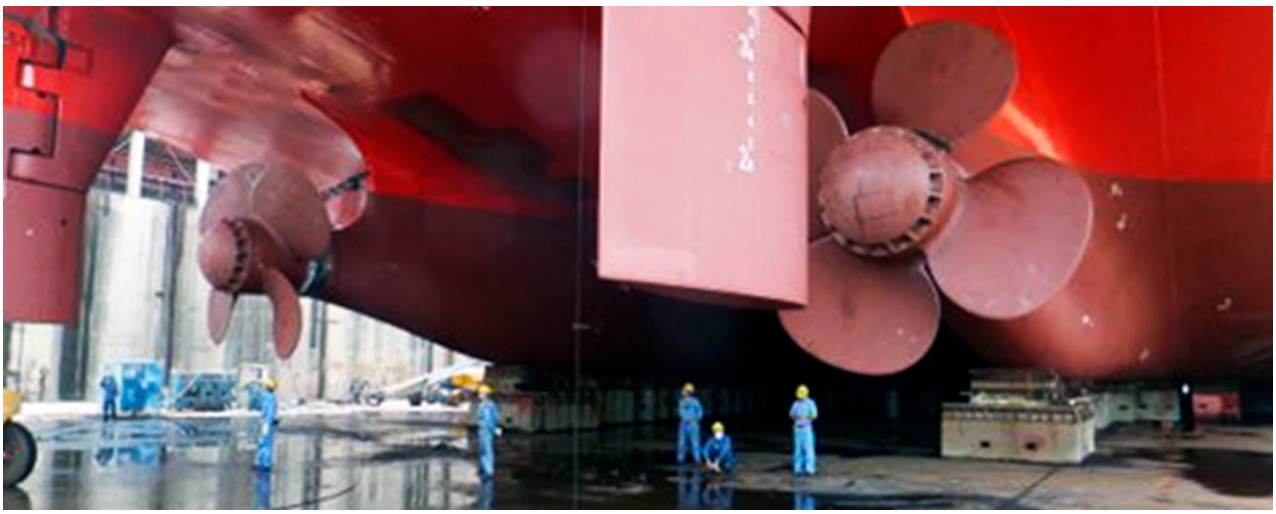
Propulsion Design References

Aker Arctic´s experience in the design and delivery of shaft lines for ice-going vessels dates back to the 1980´s and 1990´s when new ship concepts were being developed for challenging ice conditions. The original work included the development of new dimensioning criteria for propulsion system components, the design of advanced components and model- and full-scale tests. Throughout the years, Aker Arctic has actively gathered feedback from the customers on the operability and the capability of their novel propulsion solutions to further improve future designs.



Audax, Pugnax (2 x 12 MW PC3) Propellers delivered by Aker Arctic.

Example of references of past solutions with electric propulsion are:

The shallow draft river icebreakers of the **Evdokimov** class where new propulsion dimensioning criteria were applied.

The **Karhu** class Baltic icebreakers where open and nozzle propellers were installed for comparison and verifying reasons through full-scale tests.

New propulsion concepts for the **Taymyr** class nuclear icebreakers.

The diesel-electric propulsion concept to increase operational efficiency on the Baltic icebreakers **Otso** and **Kontio.**

The diesel electric propulsion design for module carriers **Audax** and **Pugnax.**

Additionally, the arctic cargo vessels of the **SA-15** class and subarctic icebreakers of the **Mudyug** class as testimonials for Aker Arctic's contributions to the knowledge of diesel mechanical propulsion systems.

The extensive databank of references positions Aker Arctic in a unique position to further advance shaftline concepts for a variety of ice-going vessels.

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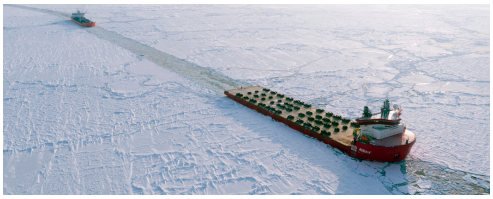
Propulsion Delivery References

Aker Arctic has continued to develop sophisticated propulsion solutions with recent deliveries of propulsion packages:



Audax, Pugnax

In 2015 and 2016 Aker Arctic delivered four 5.4-meter **PC3 fixed - pitch propellers** to Arctic module carriers Audax and Pugnax. The vessels have successfully operated year-around in the harsh ice conditions of the Arctic since their delivery.

Louhi

Aker Arctic remains a pioneer in the field through technological advancements. For many years, the standard material for high ice class propellers was stainless steel; however, bronze was typically used for low ice class propellers or nozzle propellers.
In 2016, Aker Arctic designed two bronze propellers for the multipurpose vessel Louhi. The propellers were designed by innovatively applying of **new dimensioning principles** to enable the use of bronze at a higher ice class than typically used before. The propellers were tested in full scale in the Gulf of Bothnia.

Calypso

Following a detailed inspection of the propellers in drydock, the new **dimensioning methods** for bronze propellers were validated. As a continuation to the success of Louhi's propellers, two more high ice class bronze propellers were delivered to the ice-going 1A tug Calypso in 2018.

Saimaa

Aker Arctic specializes in propulsion solutions for unconventional vessel types. The Calypso tug is paired with a detachable bow to be able to break 70 cm thick ice. The detachable bow is equipped with two shaft lines of its own, despite being pushed by the tug. Aker Arctic has designed and delivered the complete propulsion package for the **1ASuper** vessel, which was delivered in 2020.

Pohjanmaa-class corvette

The most recent propulsion package being ordered from Aker Arctic is shaft lines for the new icegoing Pohjanmaa class multi-role corvettes for the Finnish Navy. One important aspect of the design is the low underwater noise requirements which create a large challenge when designing a strong propeller. Aker Arctic's experience is crucial for the design of these **state-of-the-art propellers.**

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