

Bronze propellers: Four years in use



In January 2023, the pusher tug *Calypso* and the self-propelled detachable icebreaking bow *Saimaa* were deployed to assist shipping to and from the Finnish ports in Hamina and Kotka.

Bronze propellers delivered by Aker Arctic for high ice class vessels have been used on the tug *Calypso* since 2018. Measurements show that the propellers are working well.

Bronze has numerous benefits in marine applications. In addition to good resistance against corrosion, the material is easy to work with both during manufacturing and when carrying out maintenance and repairs. Furthermore, compared to stainless steel, the availability of bronze for propellers is better and the price is more competitive.

For these reasons, bronze has been the primary choice for open water and lower ice class ship propellers while stainless steel has been the option in higher ice classes and more demanding ice conditions.

First installation

In 2018, the first Aker Arctic bronze propellers developed for high ice class vessels were installed on the Alfons Håkans -owned tugboat *Calypso*.

During the summer season, *Calypso* uses a pair of regular bronze propellers with nozzles providing maximum thrust in tug operations. During the winter season, the nozzles are removed as they tend to become clogged with ice.



Calypso's bronze propellers for winter navigation have been used successfully since 2018. Photo from the shipyard, where the propellers waited for the winter season.

Therefore, removing the nozzles for ice operation required new propellers of either a high-strength material, such as stainless steel, or a special solution involving bronze propellers. The latter choice became Aker Arctic's new ice-strengthened bronze propellers. Although this arrangement requires a change of propellers twice a year, it provides optimal performance for both seasons.

Successful choice

During the summer months, *Calypso* is used in harbour management tasks to assist vessels in seaports in southern Finland. Since the winter of 2020-2021, she has pushed the self-propelled detachable icebreaking bow *Saimaa*.

The pusher-bow combination has

kept waterways open in the seasonally freezing Lake Saimaa area and the Saimaa Canal but was in January 2023 deployed to assist shipping to and from the Finnish ports in Hamina and Kotka.

Calypso and *Saimaa* were tested in full-scale trials in March 2021.

Aker Arctic measured the propulsion loads which confirmed that the new bronze propellers work well in ice conditions. You can read more about the tests in [Arctic Passion News #22 \(2/2021\)](#).

Years of research

Aker Arctic has researched the possibility of using bronze propellers in high ice class vessels for years in co-operation with Finnish propeller manufacturer TEVO.

Based on results from full-scale ice trials in the Bay of Bothnia with Finnish multipurpose vessel *Louhi* in 2016 and 2017, it was concluded that bronze propellers can be designed up to ice class 1A Super, the highest in the Finnish-Swedish ice class rules, and even beyond.



The Finnish multipurpose vessel *Louhi* was fitted with a bronze propeller for full-scale tests and taken to harsh ice conditions of 60 to 85 cm thick level ice and 6 metres thick ice ridges in 2016 and 2017.

In addition to normal shaft measurements, propeller-ice interaction was also observed with underwater cameras, giving valuable information for designing bronze propellers for higher ice class vessels. You can read more about these trials in [Arctic Passion News #12 \(2/2016\)](#).

Based on these tests, Aker Arctic developed the dimensioning method for bronze propellers in ice. This has now been successfully verified with *Calypso*. ■