

# Performance with turn-key solutions

Aker Arctic is mostly known for its vessel design service, engineering expertise and ice model testing. Previously, we have included delivery of certain components for construction in selected vessel projects. From this year we are expanding our ship equipment deliveries, where we take full responsibility for the design and delivering of special components and systems for ice-going vessels to customers.



The propellers, based on the results of the development program, have been installed on the Finnish ice class IA ASD tug *Calypso*.

Over the past years Aker Arctic has been engaged in various component deliveries. These pilot projects can now benefit other customers.

“Our ship equipment service includes taking responsibility for the design, delivery, installation, supervision and finally commissioning,” says Kari Laukia, Head of equipment business. “We have selected reliable partners that manufacture the components under our supervision.”

The strong know-how in shipbuilding among Aker Arctic’s employees is an advantage to customers engaging us in vessel design. When customers order special components for ice-going vessels through us we also take care of all the technical calculations and specifications which are part our expertise. “The benefit for the customer is that we ensure that the entire system is functional,” says Laukia.

These services can either complement our design projects or be bought separately. It can, for instance, be the entire propulsion system for an ice-going vessel, only the ice-going propellers, or a certain part of the shaftline.

Laukia clarifies: “Tell us your needs and we will design and deliver it to you as a turn-key solution.”

Below are some examples of successful projects from the past few years.

## Bronze propellers supplied for ice operations

Bronze has a number of benefits in marine applications such as good resistance against corrosion and cavitation damage. The material is also easy to work with both during manufacturing as well as when carrying

out maintenance and repairs, in addition to a competitive price. It is widely used for open water and low ice class ship propellers, but in more demanding ice conditions, the common choice has been stainless steel as it is a stronger material. Aker Arctic has for some years been researching the possibility of using bronze also in high ice class vessels and simultaneously decrease the propeller induced noise, jointly with Finnish propeller manufacturer TEVO.

## Full-scale tests

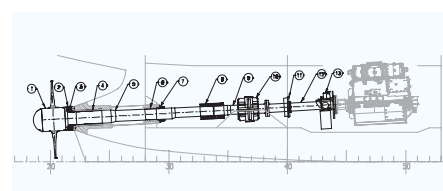
The bronze propeller concept was tested in full-scale ice trials in the Bay of Bothnia in 2016 and 2017. The Finnish multipurpose vessel *Louhi* was fitted with a bronze propeller and tested in level ice with a thickness of 60 to 85 cm, both in ahead and astern operating modes. Other tests were performed in 6 metres thick ice ridges and in ice channels.

Underwater propeller - ice interaction was also studied. These tests gave valuable information for designing bronze propellers for higher ice class vessels while fulfilling low-noise requirements.

In November 2018 the first bronze propellers based on the feedback from the ice tests were installed on the Finnish ice class IA ASD tug *Calypso*. The two NiAl bronze propellers have a diameter of 1.9 metres. The tug is now assisting vessels in seaports in Southern Finland where ice and brash ice usually appear in harbour areas during the winter. *Calypso* is owned by the Finnish towage and salvage specialist Alfons Håkans and will be used to push a self-propelled detachable icebreaking bow in Lake Saimaa next winter.



Multipurpose vessel *Louhi* is equipped with stainless steel propellers, but was fitted with a bronze propeller for ice tests in 2016 and 2017.



Aker Arctic can deliver the entire shaft line with propellers, or parts of it.

## Two shaft lines delivered

Aker Arctic has additionally designed and delivered two full shaft lines for the detachable icebreaking bow which will be pushed by tug *Calypso*. The two 600 kW aft-facing shaft lines have been installed on both sides of the innovative bow, improving its efficiency and manoeuvrability. The Finnish Transport Agency and ILS developed the icebreaking bow while Aker Arctic performed the model tests for the design. The bow is being constructed at Turku Repair Yard and will be tested in ice in early 2020.



Aker Arctic has designed and delivered two full shaft lines for the self-propelled detachable icebreaking bow, which will be fitted to tug Calypso.

The Finnish Lake Saimaa and Saimaa Canal are important waterways for the industry in Eastern Finland. The innovative self-propelled detachable bow fitted on Calypso will be able to break a wider channel than the icebreaker currently in use and possibly also lengthen the use of Saimaa waterways in winter time.

**Propeller delivery for the Arctic Module Carriers**

In 2014 Aker Arctic designed two polar class heavy deck carriers for arctic use. After construction the carriers Audax and Pugnax have been delivering LNG liquefaction plant modules from Europe and Asia to Sabetta on the Yamal peninsula. The development work was carried out in close cooperation with the shipowner, ZPMC-Red Box Energy Services.

“Our scope was the design of propellers suitable for extremely demanding use in heavy ice conditions,” says Laukia. “The customer then trusted us with the delivery of the propellers and spare blades, which took place in 2015 and 2016. Aker Arctic also supervised the installation and commissioning of the propellers.” The four PC 3 ice class propellers of 5.4 metres in diameter have bolt-on blades.

**Special equipment delivery**

Other turn-key special equipment for ice vessels we can deliver include the complete wheelhouse (ARC BRIDGE) for ice-going vessels, a bow flushing system (BFS), our ice simulator and an ice load monitoring system.



The Aker Arctic designed module carriers Audax and Pugnax are equipped with tailor-made propellers for use in extremely heavy ice conditions.

“The idea of the ARC BRIDGE is not only to bring Aker Arctic's experience in designing the wheelhouses for ice-going ships, but also to be the integrator for the entire bridge system,” Laukia explains. This includes the design, the wheelhouse fabrication, the assembly of the bridge components and co-ordinating the commissioning. Delivery of the main equipment can be included in the scope of supply or they can be delivered by the customer. The bridge fabrication and assembly are normally done at the shipyard or in the vicinity of the shipyard.

Aker Arctic has developed a bow flushing system (BFS) which decreases ice resistance for certain hull forms, lowering the propulsion power needed. “This can be an advantage for ice class ships required to meet the EEDI requirements,” says Laukia.

The Aker Arctic Ice Simulator is a useful tool in training, simulation and testing. It

can be programmed to include the customer's vessel designs, harbour designs and real icebreaking situations.

The Ice Load Monitoring System (ILMS) supports the captain in making decisions on how to proceed in an ice field and at what speed, improving safety in ice operations. Sensors located around the ship hull monitor the ice load, peak values and predict the approaching ice load, which are displayed on a monitor for a clear overview. A shaft line monitoring module can be added to the ice load monitoring tool on request.

“Several component delivery projects are currently underway. We are happy that our turn-key services have been well received among our customers. Please contact us directly for more information,” Laukia emphasises.



The Ice Load Monitoring System (ILMS) helps the captain to predict ice loads and decide how to proceed in an ice field.

**Kari Laukia, Head of ship equipment business**



Kari has been with Aker Arctic the past eight years, after transferring from Kone Marine Elevators. He has a strong background in Arctic shipbuilding, especially in developing propulsion systems for ice operations. In fact, he began his career as a propulsion design engineer at the Helsinki Shipyard and from there on Kari has continued being part of many successful projects. Two well-known examples are developing the propulsion system of Taymyr-class nuclear-powered icebreakers and being responsible for developing the azimuthing propulsion unit, Azipod, in the 1990s. At Aker Arctic, Kari has been responsible of design and engineering, while simultaneously developing the equipment business for customers. With the many new projects going on in this field, Kari now continues full-time as Head of Equipment business.

**Turn-key products available**

- Propellers for operation in ice
- Shaft line including components
- ARC Bridge (Command bridge for ice vessels)
- BFS (Bow Flushing System)
- Ice Simulator
- Ice Load Monitoring System
- Air bubbling systems