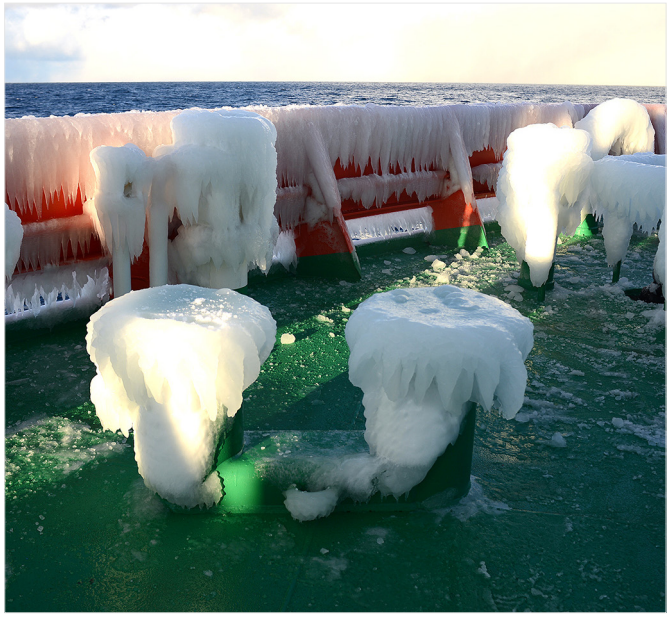
Ship operations in ice and practical winterisation

Jukka Salminen presented how ships operate in ice, both independently and with icebreaker assistance. Different design solutions for efficient ice operations were discussed. Salminen also described how icebreaking operations and ship handling in ice can be trained using an ice navigation simulator.

Rob Hindley presented practical methods and approaches for winterising ships. The target being to have a ship that is safe and functional in low temperatures and icy conditions.



The Polar Code and ice strengthening

Rob Hindley looked back at what both regulators and the industry have learned from the years since the Polar Code came into force on 1 January 2017. The goal-based nature of the Code brings opportunities for designers, builders and shipowners, but also requires closer cooperation and an understanding of the overall approach to safety and operational risk in polar environments.

Structural Engineer Ville Valtonen discussed the factors that affect the selection of the most suitable ice strengthening level for a vessel, both from a class notation perspective and the need for additional strengthening beyond the minimum ice class requirements. By selecting the correct ice strengthening level, steel weight can be minimised, while safety is ensured.

Powering of ice classed ships

Ships of any ice class bring additional costs, but there are ways to optimise this. Managing Director Reko-Antti Suojanen explained the requirements of the Finnish-Swedish Ice Class Rules concerning vessel powering, the motivation behind the rules and why they are important for the ice classes 1C, 1B, 1A and 1A Super. Power requirements and installed power can be reduced with the right design selections, and special ice model tests provide the appropriate results for a class approval. Savings can be made in investments and through lower fuel consumption.

Ilkka Saisto, Head of Ship Performance, explained different technical solutions for an ice going vessel's power requirements. What are the advantages and disadvantages of different propulsion concepts when a vessel is operating in open water, in light ice or in heavy ice conditions? Powering design aspects can be different when a vessel is assisted in icy waters or when it is travelling independently. There are also additional measures to improve ice performance. ■

NEWS IN BRIEF

Aker Arctic joins renewable energy team

The world is moving towards cleaner energy in big steps. As projects become more demanding, the need for broader expertise arises. The recently established Team Renewable Arctic Finland brings together all relevant stakeholders, investors, businesses, technology and service providers with governmental institutions for creating renewable maritime energy solutions for a sustainable future.

Aker Arctic, along with 21 Finnish companies, has joined the team to offer competitive offshore expertise to innovate, create, design and deliver scalable solutions for renewable energy. Together, these companies with a multitude of references respond on their part to the global shift towards carbon neutrality and low carbon solutions.

Customers can now access all innovative players in Finland at one point of contact, while reducing environmental impact throughout the value chain.

https://teamrenewablearctic.fi

TEAM RENEWABLE ARCTIC FINLAND

NEWS IN BRIEF

Xue Long 2 in Antarctica. Photo courtesy of PRIC.

Xue Long 2 first experiences

China's first domestically-built polar research vessel, *Xue Long 2*, has performed excellently since its delivery in July 2019, according to Captain Zhao Yanping. So far, the vessel has completed two Antarctic expeditions and is currently on her second Arctic research mission.

Aker Arctic designed the Polar Class 3 icebreaking polar research vessel for the Polar Research Institute of China (PRIC) and supported the owner in ice-related matters during the building phase, culminating in successful ice trials in Antarctica at the end of 2019.

Since then, Captain Zhao Yanping along with his crew and scientists, have continued to test her abilities.
"The wheelhouse functionality and visibility are good, with no freezing issues on windows or doors, and winterization heating mostly working well," the Captain reports.

Easy manoeuvring in ice

One of the special features of the icebreaking research vessel is the propulsion system with two azimuthing units.
"We have not operated stern first in ice conditions very often, but turning in ice has been easy," he says.

Xue Long 2 is designed to break 1.5-metre-thick ice in the polar areas. A high-performance icebreaking hull usually comes with more rolling in high waves. However, the Captain states that the rolling angle in open water is small and the anti-rolling tank works well to reduce it.
"The bow performance is also good with an acceptable level of slamming. The wave breaker prevents too much water from entering the foredeck and accumulating heavy ice."

The laboratory and moonpool areas of the vessel are remarkable and outfitted with the latest equipment to allow for a wide range of research.
"The moonpool has been clear of ice pieces. After every experiment, water has been pumped out and the moonpool kept empty," the Captain says. ■

Ari Huusela completes his race around the globe

Finnish solo sailor Ari Huusela crossed the finishing line of the Vendée Globe sailing race as the first Nordic participant ever. Aker Arctic, jointly with four other Finnish companies, helped Huusela and Merfyn Owen to design and manufacture a new keel for his boat, prior to the race.

This extremely challenging race around the globe clockwise, across the Indian Ocean, the Pacific and the Atlantic, took him 116 days,18 hours and 15 minutes. Eight of the 33 competitors had to abandon the race due to problems with their boats. Huusela did encounter challenges too, but always managed to overcome them and continue towards his goal. The race rules are such that no outside help is allowed, nor any stops during the race.

Stringent safety requirements

The new keel was especially important from a safety point of view. It was designed to fit into the place of the old keel and carry the loads specified in the 2020 IMOCA Class Rules.

The keel was made of one single billet of forged and heat-treated extra-high- strength stainless steel, with a yield strength of 800 MPa. It is strong enough to carry five times its own weight and survive a grounding force of 27 tonnes, which is more than three times the weight of the boat.

"The performance of the new keel was totally different from the original keel," says Huusela. "It was thinner, offering less water resistance, and the more flexible structure was kinder to the boat in hard waves. But above all, it felt reassuring to know that the keel was safe and would not break, as has happened to competitors previously.

Aker Arctic designed the keel using the same high-tech expertise as in their icebreaker designs. ■

New icebreaking Arctic containership design.

Suez Canal blockage raises interest in Arctic containerships

In late March, the giant container ship Ever Given blocked the Suez Canal and delayed other vessels for weeks, resulting in shortages of certain goods all over the world. A few days earlier, we introduced our new icebreaking Arctic containership design.

The Northern Sea Route is about 40 % shorter when sailing from China to central European ports than the Suez Canal route. However, year-round operation in challenging ice conditions requires specially-designed ice-strengthened vessels, which have not been available until now.

Although ice-classed containerships are more costly to build than open water vessels, the Northern Sea Route presents a viable alternative to the busy Suez Canal. After the accident, interest in the Arctic route has grown while our new Arctic containership design has also received considerable attention.

More detailed information can be found in our previous issue of Arctic Passion News. ■

Ari Huusela was extremely pleased with his new keel during the race.

Low-emission transportation on inland waterways

Two vessel concept designs have been generated in cooperation between Aalto University and Aker Arctic for the "Future Potential of Inland Waterways" (INFUTURE) project: ice class 1A for escorted and 1A Super for independent operation.

The vessel concepts have been designed with the expanded Saimaa Canal locks in mind. Both are of a similar size and capable of handling a variety of general cargo. They have a speed of 11.5 knots and are equipped with lift away hatch covers, movable tween-decks and bulkheads, and an option for gantry cranes. The main difference is their ice capability; the one concept having a traditional hull form and a single fixed pitch propeller, and the other having a double-acting ship hull and azimuthing propulsion, allowing independent operations in ice.

Reduced emissions

Both concepts would be able to extend the navigating season significantly when compared to existing vessels. They are designed to run on biofuels with the potential to reduce carbon emissions. Furthermore, they comply with the IMO BWM Convention to prevent the transportation of foreign species.

To validate the new concept designs, model-scale ice tests were conducted in the Aalto ice tank in March and April 2021.

Since 2018, INFUTURE has been evaluating attractive business opportunities in the context of inland waterway utilization and joint ventures between some key partners from Finland and Russia.

Read the full article written by Pentti Kujala and Li Fang from Aalto University at

https://www.vesitiet.org/post/inland-waterways-can-form-the-leading-edge-for-zero-emission-transport/

ANNOUNCEMENT

Mikko Patalainen has joined Aker Arctic as a structural design specialist in the Machinery and Structures team.

Mikko graduated from the Mechanical Engineering Department at Aalto University in 2010. He studied Mechanics of Materials as his major, and did his master's thesis at VTT (Technical Research Centre of Finland). After working for a few years as a research scientist at VTT, Mikko decided to challenge himself with a new field of expertise and joined Arctech Helsinki's Shipyard Hull Design Department in 2014. There he was introduced to hull design for multipurpose vessels and icebreakers; his main tasks being to carry out structural analyses for hull structures using mostly the finite element method (FEM). It was an interesting and inspiring time for Mikko, and he was able to see the actual vessels being built not more than 50 metres away from his office. Ever since, he has been working with structural design and analyses in one way or another.

Mikko enjoys the outdoors and tries to spend as much time in the nature as possible, whether it's hiking, fly fishing or just hanging out. He is also an enthusiastic badminton player. ■