



First icebreaking LNG carrier in ice trials

The *Christophe de Margerie*, the world's first icebreaking LNG tanker, has successfully completed ice trials and berthed at the gas terminal at Sabetta Port in the Yamal peninsula in Russia. Aker Arctic developed the Arctic LNG Carrier vessel concept, designed the final hull form together with Daewoo Shipbuilding & Marine Engineering (DSME) and assisted in developing the design of the entire logistics operations in Sabetta. In addition, a comprehensive model test campaign for the vessel was carried out at Aker Arctic.

The specifications of the *Christophe de Margerie* make her a unique vessel. She was assigned an Arc7 ice class, the highest ice class amongst existing merchant vessels. She is capable of sailing independently through ice up to 2.1 metres thick. According to plans, she will sail along the Northern Sea Route westward from Sabetta all year round and eastward for six months of the year (July to December). Previously, the summer navigation window on the Northern Sea Route was limited to only four months with an icebreaker escort.



The vessel can carry 172,600 m³ of LNG from Sabetta to markets in Europe and Asia. She is 299 metres long and 50 metres wide, which means that she is wider than any existing icebreaker. She is equipped with three 15 MW Azipod type propulsion units, which provide a high degree of manoeuvrability and allow the use of the double-acting principle in ice conditions.

The official ice trials took place from 19th February to 8th March 2017 in the Kara and Laptev Seas. They were attended by participating representatives of the shipyard (Daewoo Shipbuilding & Marine Engineering), key equipment suppliers, leading industry research and

design organisations, both Russian and international. Teemu Heinonen and Artur Nermann represented Aker Arctic Technology during the trials. The nuclear icebreaker *50 Let Pobedy* assisted in the ice trials.

"It was a very international crowd on the vessel," says Development Engineer Teemu Heinonen. "We boarded the ship on the 12th February in Murmansk and left a few days later towards the Barents Sea, rounding Novaya Zemlya on the northern side. On the Barents Sea, we encountered rough seas and very hard winds with gusts over 30 m/s, but the vessel managed very well in these tough circumstances."

Exceeding expectations

The official ice trials began on 19th February in the Kara Sea with vibration tests. Then followed the official performance tests in level ice ahead and astern. The vessel proved her capability to move stern-first in 1.5 metres thick ice at a speed of 7.2 knots and head-on at a speed of 2.5 knots.

In the turning tests, she managed a circle of 1,760 metres in 1.7 metres thick ice, against the planned 3,000 metres.

“On the last day of the trials, the ice ridge test was performed in an extremely heavy 15 metres thick ice ridge on the East Kara Sea, which the vessel was able to penetrate in her astern mode, demonstrating the benefits of the double-acting concept,” Heinenon adds.

“The last leg of the journey back to Murmansk was through the Kara Gate on the south side of Novaya Zemlya.”

The vessel's exceptional ice passing and manoeuvring qualities were fully confirmed by her ice trials and exceeded expectations. She was delivered to Sovcomflot after the trials and undertook her maiden voyage to Sabetta Port using the seaway canal, built to allow large capacity vessels to cross the shoal at the river mouth, and the Arctic basin, both intended for operation in difficult conditions of constant ice drift.

The *Christophe de Margerie* is the first of a series of 15 gas carriers, which are planned to be constructed for the Yamal LNG project.

A unique concept

Aker Arctic developed the concept design for the gas carrier. The hull form was developed in cooperation with Daewoo Shipbuilding & Marine Engineering and an extensive number of model tests were performed at Aker Arctic's ice laboratory. Multiple studies on how to optimally design Sabetta harbour, and how to take care of the logistics in the harbour as well as how to best transport the LNG have been conducted over the past ten years.

“The LNG tanker is unique in many ways and has special features, which are completely new,” Heinenon says. “She is exceptionally large for an ice-going vessel, but still manages well in the areas she is planned for. She is wider than any existing icebreaker. The propulsion solution with three

Azipods is also new for a tanker and increases her manoeuvrability and ice-going capabilities. Also, great attention to the open-water performance was paid during the design process and the unique bow form ensures good open water features for an ice vessel. Additionally, her machinery is of dual-fuel type, using LNG boil-off along with traditional fuels. Using LNG reduces emissions considerably.”

The *Christophe de Margerie* was designed and built according to all the requirements set by the Polar Code and is notable for her environmental safety.

Read more about the *Christophe de Margerie's* ice trials in the official press release www.scf-group.com/en/press_office/press_releases/item86398.html



From left: Won-Seok Bae (DSME), Sahng Hyon Lee (DSME), Teemu Heinonen (Aker Arctic), Artur Nermann (Aker Arctic) and Jae-Man Lee (DSME).

Meet Teemu Heinonen



Teemu joined Aker Arctic in 2008 as an assistant at the model testing facility, while he was still studying. He wrote his master's thesis about icebreaking at high speeds and graduated from Aalto University in 2010. During his studies, Teemu also spent time in Svalbard and received valuable field experience. After graduating, Teemu's work in testing continued on a permanent basis with model tests, full-scale trials and ice measurements, among other things. Today he also contributes to vessel design and works for improving vessels' ice-going performance. Teemu enjoys sailing, climbing and playing drums to chill.

The *Christophe de Margerie* transits in record time

The LNG (liquefied natural gas) tanker *Christophe de Margerie* finished her transit passage via the Northern Sea Route (NSR) with 75,656 tons of LNG onboard in record time.

On 31st July 2017 at 04:30 Moscow time, the tanker crossed meridian 68 35 E (Zhelaniya cape) and started her passage. On 6th August 2017 at 17:00 Moscow time, the LNG tanker left the NSR area by crossing line 66 05 N (Dezneva cape).

This passage took 6 and a half days, which is a record for transiting NSR.

www.nsra.ru/en/glavnaya/novosti/n13.html