

Polaris' unique concept shines in ice trials



The world's first LNG fuelled icebreaker, *Polaris*, was officially tested in full-scale ice trials towards the end of her first icebreaking season, in March, in the Bay of Bothnia.

A team of four experts from Aker Arctic: Topi Leiviskä, Toni Skogström, Tuomas Romu and Juha Alasoini, joined the vessel for five days to supervise the trials. The purpose of the ice trials was to ensure that the *Polaris* fulfils all design requirements.

"On the first day, after we left from the port of Oulu, we went looking for a demanding ridge field," explains Head of Research and Testing Services Topi Leiviskä. "We found one ridge that we measured to be 10 metres thick and 95 metres wide, which *Polaris* penetrated easily going forward."

The other ridge found, was measured to be 13.6 metres thick and 50 metres wide.

"Moving astern through the second ridge, the captain wiggled the Azipods slightly, and jointly with Arctech Helsinki shipyard, the shipowner's representatives and the captain we concluded that the ridge penetration capacity was excellent. This was one of the original requirements of the vessel," says Leiviskä.

Closer to Kemi, tests were performed in an ice channel. This ice channel stays



Polaris is able to turn 180° on the spot in ice in one minute and 15 seconds. Her turning ratio (= turning diameter per ship length) is approximately 1, meaning she can make a circle her own length.

broken all winter, but is filled with brash ice, which was measured to be 174 cm thick. *Polaris* reached a speed of 14 knots in the channel without any trouble.

For the level ice tests, the ice strength was measured to be 600 kPa.

Moving forward the speed was 12 knots in 81 cm thick ice, and through 72 cm thick ice it was 12.7 knots. Moving astern the speed in 77 cm thick ice was 11.2 knots, and in 72 cm thick ice it was 12.2 knots.

Extremely agile



This ice channel close to Kemi stays open all winter, but is filled with brash ice, which was measured 174 cm thick. *Polaris* managed 14 knots in the channel without any trouble.

Toni Skogsröm cutting out blocks of ice for measurements.

Turning tests were performed in 60-90 cm thick ice and went extremely well.

"*Polaris* is able to turn 180° in ice on the spot in one minute and 15 seconds. It is almost unbelievable how agile and easy she is to manoeuvre," Leiviskä says.

"Her turning ratio (= turning diameter per ship length) is approximately 1, meaning she can make a circle her own length, which is quite impressive for a vessel her size."

On the last evening, the icebreaker, *Sisu*, was assisting a merchant vessel stuck in the ice. The Aker Arctic team had the chance to see *Polaris* in real action, when she easily flushed and cleaned the ice away around the vessels so that they could move again.

Polaris is designed to use both LNG and MDO as fuel. The engines' normal mode is to use LNG until the power demand reaches a certain limit and then switches to MDO automatically.

The ice trials verified that *Polaris* fulfils all the design requirements.

Successful first season

"During the 2017 winter, *Polaris* turned out to be clearly the best icebreaker I have ever worked on," says Captain Pasi Järvelin about the first season with *Polaris*.

"Although the pack ice in the northernmost end of Bay of Bothnia was at times difficult to navigate, due to constant winds from southwest, I had at no point a feeling of not having enough power to manage. The most important difference to previous generations of icebreakers was, however, how the agility of the vessel brought so much pleasure in navigating. Dislodging commercial vessels stuck in the ice turned out to be fast and easy.

Apart from a few technical issues, the first winter was a real success."

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Technical specifications

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| Tonnage | 3,000 DWT |
| Length | 110 m |
| Beam | 24 m |
| Draught | 8 m (design) |
| Draught | 9 m (max) |
| Ice class | PC 4 icebreaker (+) |
| Installed power | 2 x Wärtsilä 9L34DF, 2 x Wärtsilä 12V34DF, 1 x Wärtsilä 8L20DF |
| Propulsion | three ABB Azipod-units, 1 x 6MW (bow), 2 x 6.5 MW (stern) |
| Speed | 17 knots open water, 4 knots in 1.8 m level ice |
| Endurance | 10 days on LNG, 20 days on MDO |
| Crew | 16 |