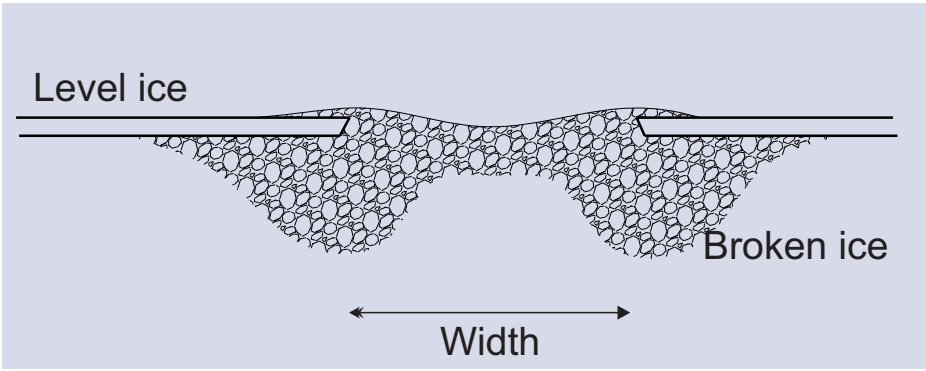
Full-scale tests in brash ice channel

Last March three Aker Arctic engineers travelled to Kemi in Bay of Bothnia, rented a snowmobile and went out on the sea ice in search of a brash ice channel for full-scale measurements.

The researchers alternated with walking to the middle of the channel to take measurements while the other two stayed on the consolidated layer taking notes with a rope tied to the sledge, ready to pull it back if something happened.



A brash ice channel is filled with ice blocks which pile up towards the edges and is thinner in the middle. Source: Sandkvist, J., 1978. Problems in Keeping Year-Round Navigation in the Luleå Harbour, IAHR-78.

Aker Arctic is leading a research project with the aim to ensure that brash ice model tests in all model testing facilities correspond with reality. A series of model tests were carried out in the ice laboratory last year, but due to the variations in the test results, full-scale channel tests were required.

Extensive measurements

Research Engineers Riikka Matala, Toni Skogström and Development Engineer Jukka-Pekka Sallinen dressed warmly with floating safety clothes and headed out to balance on the ice blocks in one of the brash ice channels outside Kemi to take measurements.

"We acquired a sledge which could carry the drilling equipment and also serve as a rescue boat in case one of us would fall into the freezing water," Matala says.

A brash ice channel is filled with ice blocks which pile up towards the edges and is thinner in the middle. It is kept unconsolidated during winter time by icebreakers and daily vessel traffic, but the surface ice blocks may at times freeze to form a thick, consolidated layer. The floating ice layer is thick enough to walk on, even when unfrozen, as during the test.

"We alternated so that one of us would walk to the middle of the channel to take measurements, while the other two stayed to take notes on the consolidated channel edge with a rope tied to the sledge, ready to pull it back if something happened," Skogström explains.

In total eight profiles were measured from different points of the channel along a distance of 2.5 kilometres, which is an extensive series of measurements. The average thickness of the middle channel was measured to be one metre, which was also the requirement for the test. The thickness on the sides of the channel was measured to be about two to three metres.

Successful tests

The vessel used for the full-scale test was cargo vessel *Eeva VG*, owned by Meriaura Ltd. She is a 103-metres-long and 13.6 metres wide dual-fuelled dry cargo carrier based on the VG EcoCoaster design, jointly developed by Meriaura Group, Foreship and Aker Arctic Technology a few years ago. Matala praises the help and assistance received from Meriaura and the ship crew.

"According to the Finnish-Swedish ice class rules, a 1A class vessel has to be able to navigate at a speed of at least 5 knots in a brash ice channel with one metre thickness," Matala continues.

"We will now perform model tests in the ice basin with the same vessel model to see how well the tests correspond with reality."

The model tests will be performed in three different ice-channels, which all fulfil the current requirements in the rules.

"The aim of the project is to test three different ways of modelling brash ice and to compare the behaviour to full scale, using the same vessel. The most reliable modelling method will then be adopted for future use. The ultimate goal is that model tests would correspond to real life in the best manner in order to give ship designers reliable guidelines for building safe vessels that correctly fulfil the ice class requirements," Matala emphasises.

The project is funded by the Finnish-Swedish Winter Navigation Research Board.

Read more about the results in next issue of Arctic Passion News.

Depending on the intensity of traffic and the temperature the surface ice blocks may freeze together to form a thick, consolidated layer. This was not the case during the test, but the floating ice layer was still thick enough to walk on.

A sledge was acquired which could carry the drilling equipment and also serve as a rescue boat in case someone would fall into the freezing water.

A snowmobile was used to travel to the brash ice channel chosen for the test.

Photograph: Meriaura Ltd.

The vessel used for the full-scale test was cargo vessel Eeva VG, owned by Meriaura Ltd. She is a 103-metres-long and 13.6 metres wide dual-fuelled dry cargo carrier based on the VG EcoCoaster design, jointly developed by Meriaura Group, Foreship and Aker Arctic Technology. Ice model tests were performed in Aker Arctic's ice laboratory in Helsinki.

Research Engineers Riikka Matala, Toni Skogström and Development Engineer Jukka-Pekka Sallinen braved the Finnish winter, dressed warmly with floating safety clothes and headed out to balance on the ice blocks in one of the brash ice channels outside Kemi for the full-scale test.

Meet Riikka Matala

Riikka graduated from Aalto University in 2012 specialising in both energy engineering and naval architecture. She had worked at Aker Arctic previously during holidays and part-time in particular projects but moved into working full time with model testing after her graduation. She runs tests in both the ice model testing facility and full-scale tests, as well as participates in research projects.

In her free-time Riikka enjoys spending time with her family, gardening and playing the saxophone in a big band.