Safeguarding winter navigation on the Baltic Sea

There are around two thousand vessels in the Baltic Sea area at any given time, carrying 750,000,000 tonnes of cargo every year. During wintertime, large parts of the sea surface are covered by ice. A two-year EU-funded project called WINMOS was set in place in 2014 to develop maritime winter navigation and safeguard the future needs of icebreaking resources in the Baltic Sea.

The objectives of the project were to ensure sustainable efficient maritime transports round the year and mitigate the barrier effect caused by sea ice by:

- Foreseeing possible changes in the future and analysing the impact on the winter navigation system and the requirements for icebreaking capacity.
- Working out proposals for different concepts and designs of icebreakers and composition of the icebreaker fleet that meet industrial and environmental demands on maritime transport.
- Reducing emissions from existing icebreakers.
- Modernising the existing Finnish-Swedish Icebreaking Management System, IBNet, and improving the accessibility to the information for all relevant stakeholders within maritime shipping.
- Developing training methods for navigation in sea ice.
- Ensuring sufficient icebreaking resources.

The long-term vision is a joint Baltic Sea Icebreaking Service where the European Union and Russia cooperate within a joint winter navigation system.

Aker Arctic's role
There were a total of seven activities in the project, of which Aker Arctic participated in three.

1. Future demand in icebreaking
The predicted impact on the present and future merchant fleet's independent ice going capacity was estimated, especially with reference to new regulations concerning sulphur emissions and the Energy Efficiency Design Index, EEDI. Based on findings from the studies, a holistic simulation model of the winter navigation system performance was worked out. The result of this Activity is of utmost importance for decisions concerning the icebreaking strategy for the period 2020-2030.
"As EEDI limits the engine sizes of future vessels, these will need more assistance in ice than previously," says Ilkka Saisto, hydrodynamics specialist and Aker Arctic coordinator for the WINMOS-project. "This increased demand needs to be planned for."

2. Next generation icebreakers
The objective was to assess the optimal composition of the Baltic Sea icebreaking fleet. A study on the required performance (size, design and engine power) of icebreakers for different areas in the Baltic Sea was performed. Available icebreaker concepts for different icebreaker categories in the Baltic Sea system were assessed. The selection of concepts for further evaluation was based on the results of the study together with findings of known performance factors of existing icebreakers and the results from Activity 1.
"The icebreaking Trimaran concept, the Oblique icebreaker, the new Finnish icebreaker *Polaris* and an add-on icebreaking bow developed by ILS were compared to URHO/ATLE class icebreakers," Saisto explains.
A study on fuelling possibilities for selected icebreaker types was performed. The study covered the effect of alternative fuels on bunker capacity, as well as their environmental impact, lifetime costs and operational propulsion efficiency. The pros and cons of various propulsion types were also considered in this study. Based on results from the study, the relative overall efficiency for different selected icebreaker concepts was performed.
Existing model-basin-data (test result in artificial ice) and models was utilised. During the project time, adjustments on power and size of the models were carried out in order to assess their suitability for operations in intended areas.
Studies on commercial and legal aspects and experiences of different ownership, chartering and operating arrangements pros and cons were performed. The study covered several aspects of various arrangements including long-term total costs, risks, control functions and liabilities.
A plan was developed on next generation icebreaker, which will support decisions for new buildings during 2020-2030.

5. The human element and training facilities
Well-trained officers on board ships will reduce the risk of accidents and maintain a high ice navigation performance. The objective of Activity 5 was to facilitate winter navigation training for ship officers. Simulator facilities and a simulator training programme for ship officers were developed. The programme will be adapted to winter navigation conditions in the Baltic Sea.
Relevant skills and their components for ship officers operating vessels in ice conditions was assessed and defined. A Baltic Sea standard simulator training program related to these skills was elaborated. Specific criteria for simulator facilities and individual ship model quality were defined. Specific shortcomings in present simulators and their modelling and presentation technologies were evaluated and listed.
The most critical simulation shortcomings for ice-training simulators were selected for development and improvement in co-operation with simulator manufacturers.
The WINMOS partnership involved public, private and academic entities from Finland, Sweden and Estonia. The project was appointed as a flagship action within the European Union Strategy for the Baltic Sea Region. The main coordinator from Finland was The Finnish Transport Agency. Ilkka Saisto coordinated the project work on behalf of Aker Arctic Technology Inc.

Meet Ilkka Saisto

Ilkka joined Aker Arctic in 2014 and is a specialist in hydrodynamics. Open water characteristics are an important feature in icebreakers and Ilkka is involved in most design projects within his area of specialisation. He worked previously at VTT Technical Research Centre of Finland in ship hydrodynamic research and arctic research.
Ilkka enjoys ships and hydrodynamics also in his free time. He has spent his summer vacations on the same sailing boat since he was a child. Nowadays his wife and two teenage daughters accompany him.