Ice Load Monitoring System commissioned remotely

The self-propelled, detachable, icebreaking bow, equipped with Aker Arctic's Ice Load Monitoring System (ILMS), was tested in May and will be delivered this autumn after final calibrations. Everything is ready for next winter's icebreaking duties in Lake Saimaa.

The innovative, self-propelled, detachable icebreaking bow was developed by ILS Ship Design & Engineering for the Finnish Transport Infrastructure Agency as part of the WINMOS II project, funded by the EU CEF programme. After delivery, it will be taken into use as soon as ice begins to form on Lake Saimaa and the Saimaa Canal, the waterway connecting Finland's largest freshwater lake with the Gulf of Finland.

Aker Arctic's Ice Load Monitoring System (ILMS) was installed to measure the propulsion loads and pin forces at the connection between the bow and the tugboat *Calypso*, which will push the bow. The propulsion load monitoring system receives signals from both the detachable bow's own two shaft lines as well as from *Calypso's* azimuthing propulsion units. The pin force measurement system, delivered by Turku Repair Yard, is also connected to Aker Arctic´s measurement system, which in turn is connected to the ship's automation system.

Remote testing

Sensors installed on the hull and the shaft lines send information to a central computer for real-time processing. In addition to displaying the information on a monitor on the ship's bridge, the data will be available online.

Designers following the sea trials remotely from Helsinki.

When the bow was taken to sea trials outside Turku in May, Aker Arctic's designers followed the tests remotely from our Helsinki office. A phone connection was also established between the ship and Aker Arctic in order to share real-time feedback about the ongoing tests and measurements.

"All signals from the vessel were displayed on our large monitor, and we knew instantly what was happening during the test," Kari Laukia, Head of Equipment Business, explains. "It was as if we had been on board."

Core idea

Having a remote connection had always been one of the core ideas from the onset in the design of the ILMS, rather than a more recent invention due to COVID-19. Being able to sit in an office and follow the vessel's operations is a big cost saving. However, with travel restrictions it has turned out to be an added benefit.

"The only thing needed is a good network connection," Laukia adds.

Ship operations surveyed

The monitoring systems on *Calypso* and the self-propelled, detachable bow run continuously, and measure loads in both ice and open water. The propulsion effect and other measurements from the propulsion system are additionally followed. The results can be combined to track various aspects related to the ship's operations, such as fuel consumption and optimisation of power use.

"For instance, there are operating situations where increasing power is not economically beneficial, such as in rough seas. In extreme operating situations the propulsion load varies substantially and getting immediate feedback is essential. Using the load monitoring system, this information is conveyed to the captain who can make decisions accordingly, thus protecting the shaft lines, propellers and the engines," Laukia says.

"In an ice situation, the information can be used to supervise how loaded the system is. It also reports

that the actual properties reflect the agreed design."

Laukia adds that the measurements taken mechanically at the shaft will tell the real effect. Otherwise, only a calculated value would be known, which can be close to accurate but never exact.

Knowing the real load effect is important for the ship's longevity. If maximum power is used in all situations, it may result in shorter maintenance intervals than expected.

Service needs identified early

An added benefit of the shaft line monitoring system is that service needs can be identified at an early stage.

"If a vessel is used in the same way for years and suddenly there is a drop in any of the indicators, the captain can react faster and deliver the vessel for a check-up," Laukia highlights.

In addition to the monitoring systems, Aker Arctic designed and delivered shaft lines and propellers for the bow unit. They improve the bow's icebreaking capability and manoeuvrability.

Calypso and the detachable bow will be used for the first time in winter 2020–21 to keep waterways in Lake Saimaa and Saimaa Canal open for an extended period. Ice trials are also planned to be held at that time.

"We'll report more about the ice load monitoring results after the trials," Laukia promises. ■

The monitoring systems are continuously on duty.

Improvement plans for Saimaa Canal

Currently about 2% of Finland's export and import cargo is transported along the Saimaa Canal. This amount could be multiplied, resulting in cost savings and environmental benefits. Photo: Jukka Väisänen

Lake Saimaa is the biggest lake in Finland with a large number of industries located on its widespread shores. The Saimaa Canal connects the lake district with the Gulf of Finland, and is a vital transport channel for exports and imports of goods.

Using Lake Saimaa waterways for logistics offers a cost-efficient, direct link to central Europe with no reloading of goods along the way. It is also an alternative to road and rail, keeping transportation costs reasonable.

Extending the opening time

Depending on the severity of the winter, the Saimaa Canal stays open around 10 months of the year. But for two winter months, the industry in the area is forced to use alternative transportation methods. There are now plans to extend the opening time in the future.

"With the new self-propelled, detachable icebreaking bow, we have high hopes for more efficient icebreaking and also ice management operations," says Jukka Väisänen, Maritime Specialist for Winter Navigation at the Finnish Transport Infrastructure Agency.

"We are very excited about the coming winter and looking forward to seeing what can be achieved with this innovative, high-tech vessel. Ice model tests performed at Aker Arctic have already promised good results."

Structural improvements underway

Structural improvements for the canal are also underway, and over the next two years another 10cm of depth will be added, meaning more cargo capacity. Expanding the locks by 10 metres in length is also planned, pending financing approval.

"In addition to more cargo, this would mean that larger vessels of a higher ice class could extend the traffic season," Väisänen explains.

New ballast water regulations enter into force in 2022, requiring the industry and ship owners to consider investing in new vessels.

"We hope that the funding for expanding the locks will be settled very soon, as companies could then begin to prepare for both the new regulations and the new lock size." ■