

Essential Tool for understanding risks during ice navigation

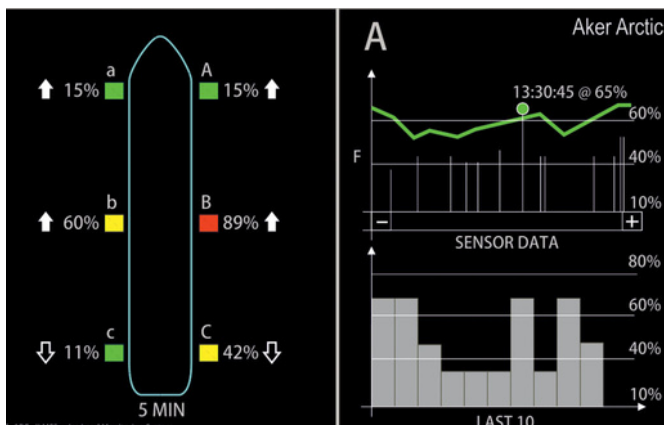
Aker Arctic

Aker Arctic Technology Inc has developed an Ice Load Monitoring System (ARC ILMS) to assist navigators monitoring ice loads on the vessel during operation.

ARC ILMS utilizes strain sensor data and processes the data to show real time ice loads as well as to forecast upcoming ice loads. Forecast calculation algorithms are based on statistical analysis of ice loads.

Ice load forecasting is an essential tool to support safe decision-making for the vessels' navigator.

Locations of sensors for ARC ILMS play a key role in obtaining reliable loads. As part of the system Aker Arctic will define the correct locations for the sensors. We also offer seasonal analysis of measured data.



ARC ILMS shows measured ice load and processes it to display following the following parameters, for each sensor:

- Current % of maximum load for hull
- Forecast trend, increasing or decreasing
- Raw data with forecasted trend
- Last 10 peak values during the past hour
- Permanent structural deformations
- Sensor condition monitoring

ARC ILMS package includes:

- Software platform with sophisticated forecasting algorithms
- Season Analysis of measured data
- Sensor location analysis
- Sensor and hardware delivery. Installation by Aker Arctic partners

ARC ILMS benefits:

- Support for safe decision making
- Season analysis of measured data
- Multiple sensor technologies can be used
- On-line monitoring and notification (Depending on vessels communication facilities)

Icebreaker *Baltika*

An ice load monitoring system was installed on board the oblique icebreaker *Baltika* in 2014. As she was a completely new vessel design, Aker Arctic wanted to measure the ice load effects on the new oblique hull form.

The system is included 22 gauges on the port side of the hull. The amount of data that is registered by the system is around 1TB per year. The results are immediately displayed on a monitor for a clear overview of the load, peak values and the predicted ice load in simplified form. This supports the captain in deciding how to proceed in an ice field and at what speed.

The ice load monitoring system is especially useful for vessels which do not constantly operate in areas with ice, as it helps the crew to



operate more efficiently and safely in ice.

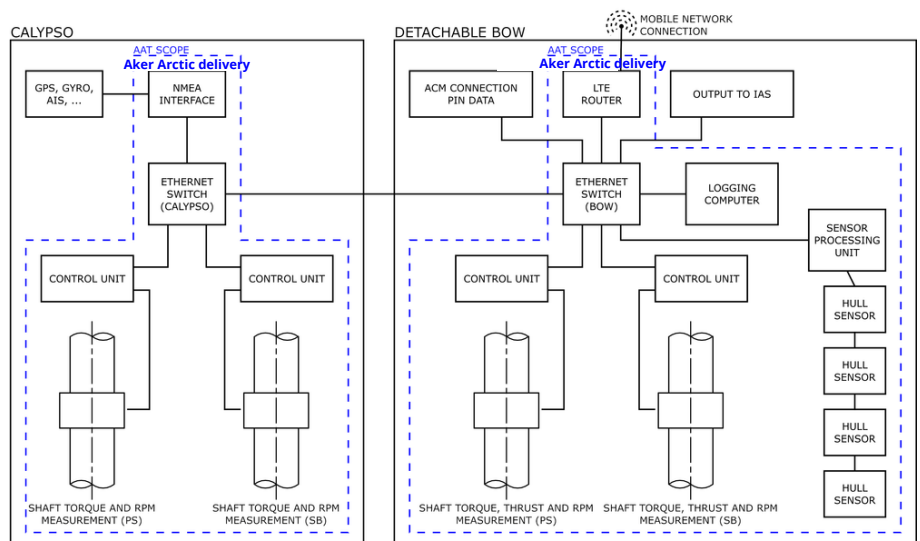
The ice load monitoring system has been operating for six years on icebreaker *Baltika*.

Detachable Icebreaking Bow



The self-propelled, detachable icebreaking bow, developed for the Finnish Transport Infrastructure Agency (FTIA), is equipped with Aker Arctic's integrated propulsion line monitoring system. The innovative system is designed to measure the loads acting on the propulsion systems of both the bow and the tug and the strength capability of the connection pins between the detachable bow and the tug *Calypto*.

Shaftline Performance Monitoring Systems can be used to monitor ship propulsion and propeller efficiency, ship condition changes and to plan operational efficiency. The shaft monitoring system helps also to reduce operation costs by fuel saving and by optimizing maintenance schedules. Hull monitoring (hull sensors) improves the operational safety, accountability, and efficiency of shipping operations.



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