The Baltika was designed to operate in Baltic Sea conditions. However, after she was delivered in 2014, she was taken to the Gulf of Ob for ice trials, and surpassed all expectations. Gazprom Neft then chartered her as an interim standby vessel for their Arctic Gates terminal, while waiting for two Aker Arctic designed high capacity icebreakers currently under construction at Vyborg Shipyard.

Three icebreakers

There are currently three icebreakers supporting oil tanker operations in the Gulf of Ob: the nuclear escort icebreaker, Vaygach, the icebreaking supply vessel, Vladislav Strizhov, and the oblique icebreaker, Baltika. The Vaygach takes care of breaking the ice, which can be up to two metres thick Arctic ice, and escorts tankers to the terminal. The Vladislav Strizhov supports the tankers in mooring. The Baltika, which is extremely easy to manoeuvre, keeps the ice channel, the tanker mooring site, and all the icebreakers’ parking sites clear of brash ice and ice rubble. She uses her inclined side to smooth the frozen edge of the channel and can also flush brash ice around a vessel while remaining stationary. The oblique mode has not been used for icebreaking, as it is not needed in her current task, and secondly the ice in the region is often much thicker than the Baltika was designed for. The oblique mode was, however, tested during ice-trials and showed that the relatively small icebreaker can create a wide channel in the ice by breaking ice obliquely, just as planned. The Baltika is also constantly ready for emergency rescue and oil spill response on site.

Aker Arctic's Development Manager, Alexey Shtrek, visited the Baltika in the Gulf of Ob in May to gather feedback about her operations and to inspect that the ice load monitoring system on board functions well.

“The feedback from the crew was that no other icebreaker can perform such ice management operations as the Baltika, even if they are more powerful,” Shtrek says. “The icebreaker master told me that the vessel is easy in operation, however requires practice to steer.”

“The unique asymmetrical hull form together with the three free-moving Steerprop propulsion units, two in the stern and one in the bow, are a winning concept.”

An ice load monitoring system has been measuring ice loads on the oblique side for two years. Data from the measurements will help developers learn more about the asymmetrical hull shape.

Successful transportation system

Five years ago, nobody thought it would be possible to explore this area with temperatures reaching -40 degrees Celsius in winter and with high-strength ice up to two metres thick. Three years ago, there was still nothing in this area during the long winter seasons. Today, there are 250-metre-long and 34-metre-wide 42,000 DWT shuttle tankers arriving every second day to the offshore loading terminal. In May, Gazprom Neft achieved a milestone when the total cumulative oil shipped from the Arctic Gates terminal exceeded five million tonnes.

“The transportation system we have created for this and other arctic projects seems to be working well,” says Shtrek.

Aker Arctic developed the powerful Aker ARC 130 A icebreaker design to support tanker loading operations at the terminal. Two vessels, the Aleksandr Sannikov and the Andrey Vilkitsky, are currently under construction at Vyborg Shipyard and will be delivered this and next year.

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>76.4 m</td>
</tr>
<tr>
<td>Beam</td>
<td>20.5 m</td>
</tr>
<tr>
<td>Draft</td>
<td>6.3 m</td>
</tr>
<tr>
<td>Diesel-electric power</td>
<td>plan with three Wärtsilä 9L26</td>
</tr>
<tr>
<td>generating sets</td>
<td>with a total output of 9 MW</td>
</tr>
<tr>
<td>Three 2.5 MW Steerprop</td>
<td>SP60PULL azimuth thrusters, two in</td>
</tr>
<tr>
<td>DP system by Navis</td>
<td>the stern, one in the bow</td>
</tr>
<tr>
<td>RMRS Icebreaker6</td>
<td>Built-in oil recovery system</td>
</tr>
</tbody>
</table>
Aker Arctic Technology Inc Newsletter

They will have a similar propulsion concept to the Baltika, consisting of three azimuth propulsion units: two in the stern and one in the bow of the vessel.

Additionally, Aker Arctic was involved in the development of the 42,000 DWT shallow-draught icebreaking shuttle tankers that were built specifically to transport oil from the Gulf of Ob to Murmansk. The hull form was developed in cooperation with Samsung Heavy Industries and the development work also consisted of ice model testing at Aker Arctic’s ice laboratory.

**Oblique icebreaker concept**

The innovative oblique icebreaker concept was the result of an innovation contest in the late 1990s. The idea was to design an icebreaker which could create a wide channel for oil tankers, without becoming too large and expensive. The exceptional concept received much attention, but construction of the first vessel only began in 2011 after the Russian Ministry of Transport decided to order one for assisting large vessels in icy harbours.

Meet Alexey Shtrek

Alexey Shtrek joined Aker Arctic this year as Development Manager. He worked previously at the Central Marine Research and Design Institute in St Petersburg, Russia, and has been involved in joint icebreaker projects with Finland since 2002. Alexey was also part of the team of experts investigating innovative proposals in icebreaking technology including the oblique icebreaker concept. During 2011-2013, he actively participated in the feasibility study of the icebreaking LNG carrier for the “Yamal LNG” project. Alexey likes to spend his free time with his wife and two small children, skiing in winter and biking in summer.

**Ice Load Monitoring System on Baltika**

The oblique icebreaker Baltika has been equipped with a strain gauge sensor based measurement system to measure ice loads. The system has been up and running since 2014.

An ice load monitoring system was installed on board the 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 ice load monitoring system installed on the Baltika included 22 gauges on the port side of the hull,” says Electrical, IT and Automation Team leader Antero Jäppinen. “The display onboard shows only the plain data from each sensor, instead of prediction and the more user friendly graphical user interface, which our current system has. The amount of data that is registered by the system is around 1TB per year.”

In the current version of the ice load monitoring system, there are sensors on several locations around a vessel’s hull. The results are also 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.

Two different types of sensors can be used, fibre-optic sensors or traditional strain gauge sensors. The advantage of fibre-optic sensors is that they are free of any electrical interference and can easily be installed on both dry and wet tanks. The main advantage of traditional sensors is the lower price range for the overall package.

A new feature under development is to add propulsion monitoring to the system. “Our plan is to offer an integrated monitoring and prediction system for ice loads on both the hull and the propulsion line in the future,” Jäppinen adds.

The asymmetrical hull form and the three propulsion units is a winning concept for excellent manoeuvrability.

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

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.