Ob – first winter experiences



- Photo courtesy of Atomflot.

The 12-megawatt diesel-electric port icebreaker Ob has successfully completed her first season in the harsh winter conditions of Sabetta, where the vessel is tasked with assisting large LNG carriers to berth.

During the period November 2019 to June 2020, Ob carried out 109 icebreaking operations to assist other ships and 254 port icebreaking operations. The total distance covered in ice was 3224 nautical miles.

"The maximum thickness of the ice in the Gulf of Ob was about 120 cm during winter navigation," says Ob's Captain Alexander Boiko. "The icebreaker overcame this thickness without any difficulties."

Ice removal at double speed

Ob's quad-azimuth propulsion configuration, with two propulsion units in the bow and two in the stern, is a totally new concept. It was selected to provide maximum operability in the thick, consolidated, brash ice that forms in the harbour basin.

"This propulsion solution should be used for any upcoming port icebreaker," Boiko underlines.

"The 2+2 configuration reduces time for berthing preparation in the port compared to a typical icebreaker configuration. It allows the icebreaker, being stationary in relation to the sea bottom, to manage ice along the berthing line and quickly clear it using the propeller flushing effect. The fact of having propulsion units at both ends of the vessel speeds up the process, as there is no need to turn relative to the berth.'

Excellent manoeuvrability

Boiko is impressed with the icebreaking capabilities of the icebreaker with its relatively small displacement and its excellent manoeuvrability.

"This was the first time I observed a 'police turn' by a vessel of such size; Ob can turn on the spot at full speed. The manoeuvrability is wonderful.'

The vessel has multiple handles which require a bit of practice to master. Boiko believes the time required depends on the skipper's experience with Azipod type propulsion units. "The vessel has fulfilled all our expectations regarding performance in ice, but propeller power up to 14 MW could be added for even better performance."





Ob's Captain Aleksander Boiko is very pleased with the first winter's icebreaking performance. – Photo courtesy of Atomflot.

Seaworthiness

During the transfer from Vyborg to Murmansk and further to Sabetta, the crew had time to become acquainted with the vessel and master the mechanisms and technical features. Seaworthiness was considered to be sufficient for bad weather and ship rolling was moderate. "The icebreaker is easy to control in open water, which positively influences its manoeuvrability in cramped port conditions. The controls and navigation tools, surveillance and communications systems are conveniently located, and all allow for manoeuvring by only one person," Boiko says.

Positive first winter

Overall, the first winter passed well in Sabetta. There was no downtime in icebreaking, and the crew learnt to take full advantage of the ship's advanced technical capabilities.

"In my opinion, the size of the vessel and its propulsion system are perfect for port work in Ob Bay ice conditions," Boiko highlights.

"Using an *Ob*-type icebreaker increases the safety level of port operations in harsh climate conditions, such as encountered at the Yamal LNG and Arctic LNG 2 projects. Safety is a priority for us, considering the economic importance of these hydrocarbon projects. It is a pleasure to complete the tasks onboard a vessel which is specially designed for the assigned tasks."



The flag ceremony was held in Murmansk in November 2019 before departing on the final leg to Sabetta. – Photo courtesy of Atomflot

The successful result of innovative cooperation

The location of the first Arctic LNG terminal project in such a challenging and entirely new environment required innovating a completely new icebreaker concept. In 2012, Aker Arctic, in cooperation with Yamal LNG, began to develop a port icebreaker charged with the task of assisting large LNG carriers.

The result of thorough development work was an exceptionally powerful port icebreaker design, the Aker ARC 124. This ship would be more capable than many seagoing escort icebreakers and incorporate many advanced technical features.

"Although *Ob* might seem large for a port icebreaker at first, she could not have been smaller considering the enormous LNG carriers she is assisting," says project engineer Tuomas Romu. "Her performance, operability, autonomy time and manoeuvrability have been carefully chosen for optimal output and to serve her purpose in the best possible way."

Quad-azimuth propulsion

Ob has a diesel-electric propulsion system consisting of four ABB Azipod ICE 1400 propulsion units: two in the bow and two in the stern. This propulsion configuration, which had previously not been used in any icebreaking vessel, was selected to provide maximum operability in thick, consolidated, brash ice.

Despite having a total propulsion power of just 12 megawatts (16,000 shp), *Ob* can break up to 1.5-metre-thick level ice in both ahead and astern directions, an unprecedented icebreaking capability for a vessel of her size. Furthermore, the all-azimuthing quad-screw-propulsion configuration provides superior manoeuvrability and control when operating in close proximity to the large LNG carriers.

World's most efficient engines

The main power plant consists of three Wärtsilä 8V31 medium-speed diesel generator sets. In addition to being powered by the world's most efficient four-stroke diesel engines, *Ob* features ABB's Onboard DC Grid to further improve efficiency and reduce fuel consumption.

The direct current (DC) system allows the diesel engines to operate at variable speed, resulting in lower specific fuel consumption (grams of fuel per kilowatt- hour of energy produced) when operating at partial load.

In addition, the system components have a smaller footprint compared to a traditional alternating current (AC) system, saving space within the already compact machinery spaces.

Safety and comfort at -50°C

Besides featuring many "firsts" in its machinery systems, Ob is designed to operate in harsh Arctic winter conditions where ambient air temperatures reach as low as -50° C, and provide safe and comfortable living and working conditions for the crew throughout the polar night.

"I want to highlight that the achievement of such an extraordinary vessel is the result of successful cooperation between the designers, FSUE Atomflot, Vyborg



Development of port fleet for Sabetta begins jointly with Yamal LNG. Yamal LNG and Atomflot sign agreement on Sabetta port fleet. Shipbuilding contract signed between Atomflot and Vyborg Shipyard. Basic design continues. Shipyard as well as the Russian Maritime Register of Shipping," Romu adds. "The boldness to find and accept new ideas with an open mind has been the recipe for success."

Seven-year-project

At the project's inception in 2012, the initial evaluation considered three alternative designs: a conventional design with two azimuthing propulsion units in the stern, an asymmetric oblique icebreaker with three thrusters, and a novel concept with two propulsors in both bow and stern. It was determined that the most suitable port icebreaker design for the heavy brash ice conditions prevalent at the Arctic LNG terminal would be the quad-screw variant.

The keel was laid at Vyborg Shipyard in 2016 and Aker Arctic continued providing technical support during the entire construction period. The official launch ceremony took place in 2018, and the vessel left for her first sea trials in the Gulf of Finland in September 2019, with delivery to FSUE Atomflot a month later.

Ob is, at the time of writing, still the newest icebreaker in the world.



Even the world's largest and most powerful nuclearpowered icebreaker, 50 Let Pobedy, is dwarfed by the 299-metre Yamalmax LNG carriers transporting natural gas from Sabetta. – Photo by Dmitri Lobusov



Atomflot's largest and smallest icebreakers moored together as Ob receives fresh water from the nuclearpowered icebreaker 50 Let Pobedy off Sabetta. – Photo by Dmitri Lobusov

Future vessels

Construction work in the Gulf of Ob continues. The Arctic LNG 2 project advances at speed and although there is no information yet of what kind of vessels are planned for the new terminals, it is certain that every terminal in this difficult area will need its own port fleet.

"We are now gathering feedback about *Ob* in order to use that information in possible future projects," Romu states. "Already during the design process, new ideas arose which can benefit future vessels. One such possibility is actually using LNG as fuel; we already have experience of designing such vessels, in addition to LNG being the fuel available in the area."

Ice trials postponed

Due to COVID-19, the planned ice trials have been postponed. Romu remains hopeful they will take place, as they provide invaluable information to the designers.

"In our design work, we always strive to design a vessel which is perfect for its intended task and operating environment. The first years of design work include countless hours of planning, innovating and background work. Data from previous ice trials and operator feedback is thoroughly examined during this phase."



8/2017

9/2018

9/2019

Delivery in Vyborg. Ob departs

10/2019

for Murmansk.

Ob arrives in Sabetta.

2019

Float-out for final hull assembly and outfitting.

Launching and naming ceremony.

First sea trials in Gulf of Finland.