Latest News from Aker Arctic

Reko-Antti Suojanen
Managing Director
Aker Arctic Technology Inc
28th February 2019
Aker Arctic Technology Inc
Services

- Consulting and Technology Development
- Ship Design & Engineering
- Ice Model Tests
- Products for Ice Operations
- Full Scale Tests
- Operational Services
Active World Icebreaker Fleet

The data includes following ship types:
- icebreakers and other vessels engaged in icebreaking operations;
- icebreaking research vessels; and
- other vessels with significant icebreaking capability.

The following ships are excluded:
- cargo ships;
- oil tankers; and
- LNG carriers.

Decommissionings from 2019 onwards are not taken into account.
Active World Icebreaker Fleet – Age Distribution

- Over 50 years: 11 vessels
- 40...49 years: 31 vessels
- 30...39 years: 32 vessels
- 20...29 years: 14 vessels
- 10...19 years: 21 vessels
- Less than 10 years: 33 vessels
- Under construction or on order: 21 vessels
Latest Icebreaker Development – Technology

Icebreaking game-changer of the 2010s: **Polaris**
- Environmentally friendly dual-fuel power plant using liquefied natural gas (LNG) as primary fuel
- New propulsion configuration – return of the bow propeller
- Design goal: not just powerful, but also efficient – achieved!

Derivative designs
- Further development of the general concept for harsh Arctic conditions: **Aleksandr Sannikov** and **Andrey Vilkitsky**
- LNG now considered realistic alternative for polar icebreakers: Aker ARC 123 for FSUE Atomflot
Latest Icebreaker Development – USCG Activities on Polar Icebreakers

- USCG plan to replace existing polar class icebreaker Polar Star and Polar Sea is progressing.
- USCG financed industry studies for the new vessel in 2017-2018.
- Three US shipyards have issued a bid for this program.
- USCG is expected to make selection by end of April.
- The first vessel should be ready for delivery 2023.
Latest Icebreaker Development – Canadian Activities

- Major countries are investing in new polar icebreakers
  - Canadian Coast Guard has plans for a large polar icebreaker, CCGS John G. Diefenbaker
  - Canada bought 3 Viking Class icebreakers
  - Canada is planning to increase capacity by additional interim icebreakers
A Significant Breakthrough for the Arctic Ships

- Yamal LNG, first ever Arctic LNG project to start

LNG production is now in full capacity. Already 10 million tons of LNG shipped from Sabetta.
Recent Construction with Aker Arctic Design

<table>
<thead>
<tr>
<th>Delivery</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yamal LNG Carriers (15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aker ARC 130A</td>
<td></td>
<td></td>
<td>DELIVERED</td>
<td>DELIVERED</td>
</tr>
<tr>
<td>Aker ARC 130A</td>
<td></td>
<td></td>
<td>DELIVERED</td>
<td></td>
</tr>
<tr>
<td>Aker ARC 124</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arctic Condensate Tanker</td>
<td></td>
<td>DELIVERED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aker ARC 128</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icebreaking Cruise Vessel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Yamal LNG Carriers (15) 2018
Aker ARC 130A 2019
Aker ARC 130A 2020
Aker ARC 130A 2021
Aker ARC 124 2018
Aker ARC 124 2019
Aker ARC 124 2020
Aker ARC 124 2021
Arctic Condensate Tanker 2019
Arctic Condensate Tanker 2020
Arctic Condensate Tanker 2021
Aker ARC 128 2018
Aker ARC 128 2019
Aker ARC 128 2020
Aker ARC 128 2021
Icebreaking Cruise Vessel 2019
Icebreaking Cruise Vessel 2020
Icebreaking Cruise Vessel 2021
Aker ARC 130 A Icebreaking Support Vessels
Aleksandr Sannikov, Andrey Vilkitsky

Length, overall 121.7 m
Breadth, dw., moulded 25 m
Draught, design waterline 8 m
Displacement 12 900 m³

Icebreaking capability ahead:
2 knots, 2.0 m+30 cm snow

Icebreaking capability astern:
2 knots, 2.0 m+30 cm snow

Owner: Gazpromneft
Builder: Vyborg Shipyard JSC
Delivery: 2018
Aker ARC 212, Arctic Condensate Tanker

Length, overall 214 m
Breadth 34 m
Draught, ice 12.0 m
Cargo and slop tanks about 57,000 m$^3$

Main generating sets 31.4 MW (total)
Propulsion units 2 x 11 MW ABB Azipod
Icebreaking capability 1.5 m (ahead) 1.8 m (astern)
Service speed 13 knots
Ice class RMRS ARC7 (equivalent to Polar Class 3)
Dual classification: Russian Maritime Register of Shipping
Bureau Veritas
Owner: Dynagas
Builder: Guangzhou Shipyards International
Delivery: 2018
Aker ARC 124, Port Icebreaker for Atomflot, IB OB

Length, over all: 89.5 m
Breadth, including fenders: 21.3 m
Draught, maximum: 7.5 m
Main generating sets: 3 x 4880 kW
Propulsion: Diesel-electric
  4 x 3000 kW azimuth thrusters

Icebreaking capability: 2 knots in 1.5 m level ice
  4 knots in 5.0 m brash ice with 50 cm consolidated layer
Bollard pull: 115 tons
Speed in open water: 15 knots
Ice class: RMRS Icebreaker 7, or IACS Polar Class 3
RESEARCH ICEBREAKERS
Chinese Icebreaking research vessel for PRIC, PC3

- Design contract 2012
- Feasibility 2015
- Design complete 2017

- Construction ongoing
- Delivery 2019

- Jiangnan Shipyard, Shanghai
- Name: Xue Long 2
RSV Nuyina
Australia's new Antarctic icebreaker is due to arrive in Hobart in 2020. She will be the main lifeline to Australia's Antarctic and sub-Antarctic research stations and the central platform of their Antarctic and Southern Ocean scientific research.

Sir David Attenborough
The new polar ship for the United Kingdom will spend the northern summer supporting Arctic research and the austral summer in Antarctica carrying out research programmes and resupplying the British Antarctic Survey's research stations. Her expected delivery is in summer 2019 and the vessel will replace the two polar ships RRS Ernest Shackleton and RRS James Clark Ross.

Antártica 1
Construction of the icebreaking research vessel for the Chilean Navy began last year with delivery expected during 2021. Its tasks will include logistic support, search and rescue, and scientific research south from the Antarctic Polar Circle. She will replace the icebreaker Almirante Óscar Viel which was acquired from Canada in the 1990s. Aker Arctic supported Canada-based Vard Marine in the design of the hull form and performed model tests.
Innovation – Sidepool - for deploying research instruments
CRUISE ICEBREAKERS
Polar Cruises

- Cruise market is increasing, and also interest in the polar regions is on the rise.
- Expedition type cruises have been carried out for a long time.
- Majority of them in "small scale" operations.
- Cruise prices vary a lot, starting from few thousands up to 40 000 USD for the North Pole voyages.
- Today the capability is increasing, as many new polar class cruise vessel’s are coming into market.
Increase in the World Tourism
Le Commandant Charcot - First ever Icebreaking Cruise Vessel

- First ever PC 2 classed vessel
- Propulsion - LNG & Hybrid Electric
- PAX Cabins 135
- Aker Arctic DAS™
Aker Arctic
The Ice Technology Partner