Sustainable Arctic Shipping

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- Keynote speaker: **Loukas Kontogiannis**, Head of Marine Pollution, Marine Environment Division, International Maritime Organization (IMO)
- Expert presentations: **Evgeniy Ambrosov**, Senior Executive Vice-President and Chief Operating Officer, PAO Sovcomflot, Deputy Chair, Arctic Economic Council, Russian Federation; **Liza Mack**, Executive Director, Aleut International Association, Alaska; **Andrew Fleming**, British Antarctic Survey, United Kingdom; **Jón Bernódusson**, Subject leader, Public Admin and Development, Transport Authority of Iceland
- Video presentations: [https://vimeo.com/showcase/7614129](https://vimeo.com/showcase/7614129)
Sustainable Arctic Shipping

SAO Marine Mechanism Fall 2020 Webinar Series

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Loukas Kontogiannis
Marine Environment Division
International Maritime Organization
The International Maritime Organization (IMO)

1948 IMO Convention - Article 1a

The aim of the IMO is to:

• provide a framework for cooperation among Governments in the field of regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; and

• encourage and facilitate the general adoption of the highest practicable standards in matters concerning the:
  o maritime safety,
  o efficiency of navigation and
  o prevention and control of marine pollution from ships

IMO’s mission is to ensure safe, secure, clean, efficient and sustainable shipping on cleaner oceans
IMO and the SDGs
IMO legislative map – main instruments

IMO Instruments
- **Pollution Response**
  - Oil Pollution Preparedness, Response and Cooperation (OPRC) Convention and OPRC-HNS Protocol
- **Pollution Control**
  - MARPOL, London Conv/Protocol, Ballast Water Management Conv, Anti Fouling Systems (AFS), Hong Kong Convention on Ship Recycling
- **Safety**
  - SOLAS
  - COLREG
  - STCW
  - LL
  - SAR
- **Compensation**
  - Civil Liability (and the associated IOPC Fund Conventions)

UNSCLOS
- Universal Conventions
  - Vienna, Montreal, Stockholm, UNFCC, etc.

Regional Agreements

Regional Laws

NATIONAL LEGISLATION
WHAT DOES THE POLAR CODE MEAN FOR SHIP SAFETY?

**EQUIPMENT**
- **Windows on Bridge**: Means to clear smoke, fire, housing, seats, means, and вход
- **Lifeboats**: All liferafts to be provided or fully enclosed type
- **Clothing 1**: Adequate thermal protection or all persons on board
- **Clothing 2**: On passenger ships, an additional set or a thermal protective suit for each passenger on board
- **Ice Removal**: Special equipment for ice breaking, mechanical, and pneumatic devices
- **Fire Safety**: Fire extinguishing equipment capable of low temperature; water or breathing apparatus

**DESIGN & CONSTRUCTION**
- **Ship Categories**: Three categories of ships, each requiring appropriate design criteria
- **Ice Strengthening**: Ice-strengthened or ice-classed ship
- **Intact Stability**: Moreover, providing additional ice Strengthening
- **Structural Integrity**: When used in ice-strengthened condition, the structure of the ship must be able to remain safe under the long periods

**OPERATIONS & MANNING**
- **Navigation**: Requires navigational aids for fair conditions
- **Training**: Emergency, cold water and cold water temperature response training for all crew members, including ice

**BACKGROUND INFO**
- The International Code for Ships Operating in Polar Waters and Hötztas Parameters (ICOS) of the IMO Maritime Safety Committee
- It applies to ships operating in Arctic and Antarctic Waters
- This guide provides for the implementation of the protection of the polar environment by assessing and implementing appropriate requirements to mitigate by other instruments
Arctic shipping best practice information forum

THE ARCTIC SHIPPING BEST PRACTICE INFORMATION FORUM

The establishment of the Arctic Shipping Best Practice Information Forum is in response to the adopted International Code for Ships Operating in Polar Waters (Polar Code) by means of amendments to the International Convention for the Safety of
Initial IMO Strategy on reduction of GHG from ships

adopted
Initial IMO Strategy on reduction of GHG from ships

Vision:
“IMO remains committed to reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century”

.. the Initial Strategy identifies levels of ambition for the international shipping sector noting that technological innovation and the global introduction of alternative fuels and/or energy sources for international shipping will be integral to achieve the overall ambition......

..1 carbon intensity of the ship to decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships to review with the aim to strengthen the energy efficiency design requirements for ships with the percentage improvement for each phase to be determined for each ship type, as appropriate;

..2 carbon intensity of international shipping to decline (for all ships) to reduce CO₂ emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008; and

..3 GHG emissions from international shipping to peak and decline to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008, whilst pursuing efforts towards phasing them out as called for in the Vision as a point on a pathway of CO₂ emissions reduction consistent with the Paris Agreement temperature goals.
IMO Action Plan on Marine Plastic Litter

IMO plays a key role in tackling the ocean plastic challenge:

- To further enhance its commitment to reducing marine plastic litter from ships, IMO adopted in October 2018 the **IMO Action Plan to address marine plastic litter from ships** (resolution MEPC.310(73))
Ongoing work at the Sub-Committee on Pollution Prevention and Response

- Reduction of the impact on the Arctic of Black Carbon emissions from international shipping
- Development of measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters
- Development of amendments to MARPOL to allow States with ports in the Arctic region to enter into regional arrangements for port reception facilities
Closing

• The global shipping sector is essential for a sustainable future.

• Economic sustainability has to be looked at in combination with the ocean’s capacity to remain healthy and diverse in the long term.

• This is all the more important in the Arctic which poses many unique challenges that are best faced through international cooperation and by setting common objectives.
Thank you for your attention
Sustainable Arctic Shipping: SCF Perspective
SCF (Sovcomflot): Overview

- The largest shipping company in Russia and a global leader in energy shipping and servicing offshore oil and gas production.

- Total fleet: 146 vessels (combined deadweight of over 12.6 million tons).

- Special focus on operations in harsh environments. SCF is the world’s largest owner and operator of ice-class vessels (83, over half of our fleet).

- Operating in the Russian Arctic since 2008. Servicing major energy projects in the region: Yamal LNG; Varandey; Prirazlomnoye; Novy Port, with several projects in the pipeline: Arctic LNG 2; Obsky LNG.

- Strong focus on ensuring long-term sustainability of the Arctic shipping through crew training, introducing advanced technological / engineering solutions, and promoting industry-wide initiatives.

- Named the Company of the Year 2019 by Lloyd’s List for ‘showing industry leadership in many ways, from its pioneering steps towards decarbonization and the introduction of advanced technology, to its industry-leading safety record, which comes despite operating in some of the world’s harshest conditions.’
SCF is the World Pioneer in adopting LNG as a Cleaner-Burning Fuel

- A core element of our long-term strategy is ‘Green Charter’: we commit ourselves to continually reducing the carbon footprint of our operations.
- In 2015, SCF pioneered the adoption of LNG fuel for large-capacity crude oil tankers: a major step forward decarbonization of the tanker industry.
- Six LNG-fueled Arc7 ice-class crude oil tankers are in operation since 2018 and five more under construction.
- All new vessels SCF plans to order will use LNG as a primary fuel.
- SCF actively promotes the development of the LNG fuel market and infrastructure.

SCF’s experience of operating LNG-fueled tankers for two years shows that using LNG reduces emissions of:

- **Sulphur oxides (SOx)** - 100%
- **Particulate matter (PM)** - 100%
- **Nitrogen oxides (NOx)** - 94%
- **Carbon dioxide (CO2)** - 27%
Introducing LNG Fuel for the Arctic Operations

- LNG fuel has good prospects for adoption as a fuel for vessels operating in the Arctic, considering the sensitive Arctic environment and high Arctic safety standards.

- In 2019, SCF pioneered the introduction of LNG fuel for marine cargo transportation in the Arctic.

- In September 2019 Korolev Prospect has became the first large-capacity tanker to cross the entire Northern Sea Route using only LNG fuel.

- In October 2019, two of her sister ships also completed similar transit voyages along the NSR in LNG fuel mode.

- SCF has demonstrated its commitment to using cleaner-burning fuel for operations in the Arctic, reducing the emissions footprint of vessels, which is critical given the fragility of the Arctic ecosystem.
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Extending the Navigation Window Along the Northern Sea Route

• In 2020, icebreaking LNG carrier Christophe de Margerie became the first large-capacity vessel to transit the Northern Sea Route eastbound in May, two months earlier than normal.
• This voyage has confirmed that the navigation season in the eastern part of the Russian Arctic can be substantially extended: a major step towards enabling a year-round navigation along the NSR.
• In addition to increasing the window of navigation along the NSR, the voyage was over a third shorter than routing via the Suez Canal, leading to reduced vessel emissions.
• Together with Atomflot, SCF plans to extend the navigation period even further in 2021, with an experimental early voyage scheduled for February 2021.
Focus on LNG Transportation

• SCF is both a major consumer and a global maritime carrier of cleaner-burning LNG.

• SCF is a key logistics partner in facilitating current and future exports of LNG from the Russian Arctic (Yamal LNG; Arctic LNG 2, and Obsky LNG projects)

• SCF has 15 Arc7 LNG carriers under construction (owned directly and through a joint venture with NOVATEK), contracted in 2019-2020, with several more such vessels in the pipeline.

• This new generation of Arctic LNG carriers was designed based on SCF’s long-standing experience of safely operating vessels in challenging ice conditions.

• Upon delivery of these vessels, SCF is expected to become the largest operator of Arctic LNG carriers.

• Growing our LNG fleet is a strategic priority for SCF. Two-thirds of all vessels currently ordered by SCF are destined to expand our LNG fleet.
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Safety Comes First

- Safe navigation in the Arctic relies primarily on crew skills and competencies, so SCF heavily invests in personnel development. Our key advantage is knowing how to recruit and train crews for operating in the Arctic.
- A specialised SCF Training Centre in St. Petersburg covers the full range of marine operations in the Arctic. It trains both SCF's own crews and crews from other shipping companies working in the Arctic (including Yamal LNG crews).
- We are further enhancing capabilities of SCF Operations Centre for real-time vessel tracking in the Arctic, opened in 2018: new digital solutions for ice conditions mapping, plotting safe routes in ice, and identifying areas with dangerous ice formations.
- In 2019, through extensive simulation, SCF experts have determined the conditions for safe navigation within the seaway channel at the Gulf of Ob. Based on their recommendations, the Russian Ministry of Transport approved the reconstruction of the channel.
- Consistent efforts to structure and share our vast experience of ice navigation: several unique manuals published in 2019-2020, including books that cover operating LNG carriers with three Azipod propulsion units and interpreting satellite data on ice conditions.
Expected Distribution of Mineral Cargo Flows Along the Northern Sea Route

Data sources: Russia’s Ministry of Natural Resources, oil/gas and mining and transport companies; analysis by GECON
Major Mineral Resources Projects with Maritime Transportation Scheme in the Russian Arctic
Proposed Further Steps to Ensure the Safety of Arctic Shipping

- Embrace an integrated approach to developing navigational safety infrastructure, icebreaking support, navigation systems, cartography, etc.
- Launch an Arctic satellite constellation to provide timely updates on ice conditions along the full length of the NSR, and ensure reliable satellite communication along the NSR above 70 degrees North latitude, outside the Inmarsat coverage area.
- Intensify mapping and hydrographic studies along the NSR, including both conventional shipping routes and high-latitude routes.
- Take steps to ensure rescue and emergency aid services along the full length of the NSR.
- Revise education plans for cadets studying navigation in maritime academies to introduce new Arctic competences.
- Further restrict substandard vessels and vessels crewed by inexperienced or poorly qualified personnel from operating in the Arctic.
How could the Arctic Council respond to the Arctic shipping challenges

- Arctic Council has come up with several initiatives to elaborate the optimal solution to ensure the sustainability of the Arctic shipping.

- One such initiative is the Arctic Shipping Best Practice Information Forum, established in 2017 within Protection of the Arctic Marine Environment Working Group (PAME) in response to the adoption of the Polar Code by the International Maritime Organization (IMO). It seeks to raise awareness of its provisions amongst all those involved in or potentially affected by Arctic shipping operations and to facilitate the exchange of information and best practices between the Forum participants on specific shipping topics (hydrography, search and rescue, industry guidelines and ship equipment, etc).

- Each member state of the Arctic Council is interested in ensuring the sustainability of the Arctic shipping, which implies a clear understanding that the shipping operations in the Arctic should be environmentally and socially friendly while remaining economically viable.
Sea Ice Information for Sustainable Arctic Shipping
Sea ice information contributes to safe and efficient navigation
Arctic Sea Ice Age

EASE-Grid Sea Ice Age, v4.1
Aug 27 - Sep 2, 1985

EASE-Grid Sea Ice Age (QL)
Sep 2 - 8, 2020

Age (years)
0-1 1-2 2-3 3-4 4+

Graphic courtesy NASA NSIDC
Arctic tourist ship traffic for 2019 from PAME Arctic Ship Traffic Data (ASTD)
Svalbard tourist ship traffic from ATSD for 2018 relative to sea ice edge (orange line)
Copernicus Sentinel-1 Arctic coverage
Previous 72 hour period on 6th October 2020

Copernicus Sentinel-1 image of north-west Svalbard
Acquired 05-10-2020 06:38:38 UTC
Copernicus Sentinel-1 Arctic coverage

Previous 72 hour period on 6th October 2020

Copernicus Sentinel-1 image of north-west Svalbard
Acquired 05-10-2020 06:38:38 UTC

Sea ice motion vectors November 2019
Data courtesy of DTU/Copernicus Marine Service
Outlook

✧ Sea ice information remains important to support safe and efficient maritime operations in the Arctic
✧ Decreasing sea ice does not remove the risk and ship traffic increasing
✧ Risk assessment systems such as POLARIS need good input information
✧ Open access to satellite data allows development of new automatic information products
✧ Requirement for sea ice forecasts for all regions
✧ Integration with satellite AIS ship tracking allows tailored information services
✧ Information delivery to ships operating in Arctic still limited by satellite communication options
ICELANDIC TRANSPORT AUTHORITY

Sustainable Arctic Shipping

Research Program Northeast Passage 2019-2023

SMM Session, Thursday, 8 October 2020

Jón Bernódusson
Subject Leader, Research and Development
Sustainable Arctic Shipping

The Arctic
Northern Sea Route

Opportunities and benefits

• Societal issues
  – New challenges => the ice is rapidly melting

• Economic opportunities
  – Economics -> Arctic resources

• Safety aspects
  – Polar Code => appropriate ships and safety requirements

• Environmental issues
  – Environment risk is high => sensitive nature
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The Arctic
Northern Sea Route

• **Societal issues**
  – New forum for progress and development
  – The ice surface has been reduced rapidly – faster than expected
  – The Arctic will be like the Baltic Sea in the near future – ice-free in summer and thin ice in winter
  – Properly equipped ships will be able to sail freely around the area
  – It was not long ago that we knew more about the moon than the Arctic
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**Shorter shipping routes**

The difference between the red and the yellow routes is 5,200 nautical miles.

This equals approximately 15 days of sailing time.
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The Arctic
Northern Sea Route

• **Economic opportunities**
  – At least 18% of the earth’s oil reserves and 30% of the earth’s gas reserves are believed to be located in the Arctic region
  – The area is rich in metals
  – Resource utilization from gas, oil and metals in the area
  – Generous fishing grounds
  – Growing tourism opportunities
  – New market for export and import of valuable products
  – Increasing living standard for the population in Arctic areas
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The Arctic
Northern Sea Route

• **Safety aspects**
  – Polar Code with new and appropriate construction of ships
  – Weather and sea state and weather forecast
  – Ensure reliable telecommunication
  – Organization of search and rescue
  – Training for seafarers and fishermen
  – Risk assessment for the sailing routes
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The Arctic
Northern Sea Route

• **Environmental issues**
  – The environmental risks are high since nature is sensitive and fragile
  – Fossil fuels or renewable fuels
  – Exhaust gas from marine engines
  – Soot particles (PM and Black Carbon)
  – Greenhouse gases
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The Artic Northern Sea Route

• **Environmental issues - fuels**
  – Fossil fuels and renewable fuels
  – Fossil diesel for ships - marine diesel oil, heavy fuel oil
  – Biodiesel - canola, synthetic diesel (BtL), green algae
  – LNG - Liquefied natural gas (-162°C)
  – DME (Dimetylether) - Anhydrous methanol (energy carrier)
  – Hydrogen (H₂) - Electrolysis of water (energy carrier)
  – Methanol - liquid alcohol (energy carrier)
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The Artic
Northern Sea Route

• Environmental issues – exhaust gas cleaning
  – Exhaust gas from marine engines – cleaning of PM and BC
  – Water Emulsion - water together with oil and air in the engine’s chamber
  – Exhaust gas cleaning as water scrubbing - water sprayed on soot particles
  – Exhaust gas cleaning with chemical solution - chemical solution sprayed on soot particles
  – Exhaust gas cleaning with plasma - mainly cleaning of nitrogen (NOx)
  – Exhaust gas recycling - exhaust gases circulated in the exhaust system and reburned
Soot particles from engine’s exhaust gases settle on the ice and melt it.
Sustainable Arctic Shipping

The Arctic
Northern Sea Route

For reflection

• Reduction in Arctic sea ice, resource exploration and advances in shipping have called for scheduled shipping operation in the Arctic Region
• In recent years, a number of ships have navigated the Northeast Passage
• Environmental issues need to be addressed through research into the harmful effects of fossil fuels, emissions from ship engines and soot particles
• Iceland has considerable interest in protecting this pristine Region, whether directly or indirectly
• It is important that the Icelandic Government plays a leading role in the protection of the Arctic and encourages other States to do the same
• Transshipment port (hub) in Iceland is being planet
Thank you for your attention