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EMERGENCY PREVENTION, PREPAREDNESS AND RESPONSE

PAME
Protection of the Arctic Marine Environment

Low Sulphur fuels, fate and behavior in cold water conditions

A joint PAME and EPPR project

Arctic Council member states and observer states participants

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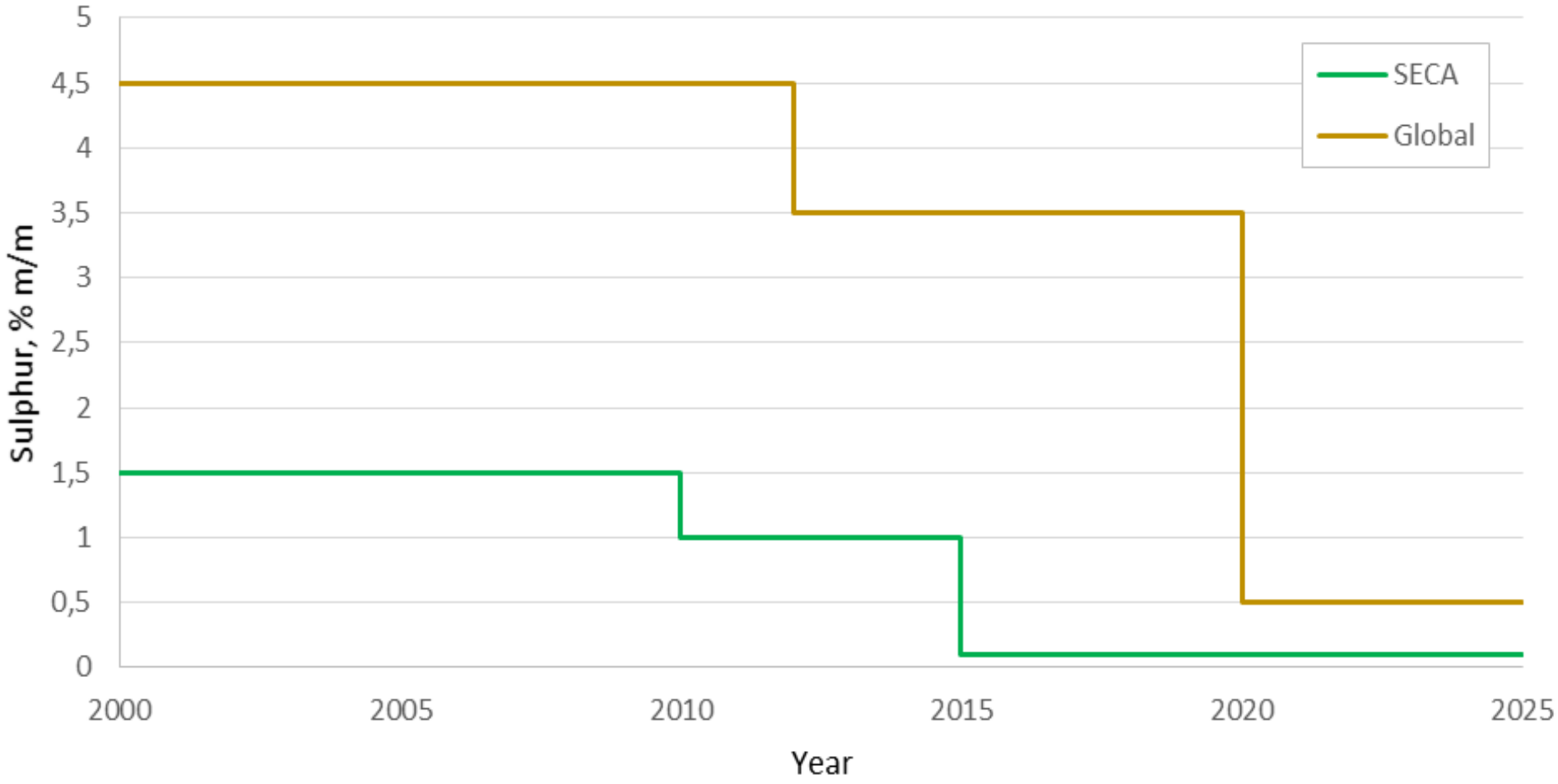
- Canada *
- USA *
- Norway *
- Kingdom of Denmark
- Iceland
- Finland
- Sweden
- China *
- Germany
- South Korea
- Singapore

- **Other experts**
- World wide Fund for Nature (WWF)
- DNV
- SINTEF

Background: global efforts to improve air quality by removing Sulphur from ship fuel has lead to unwanted side effects for oil pollution preparedness and response



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Project Deliverables

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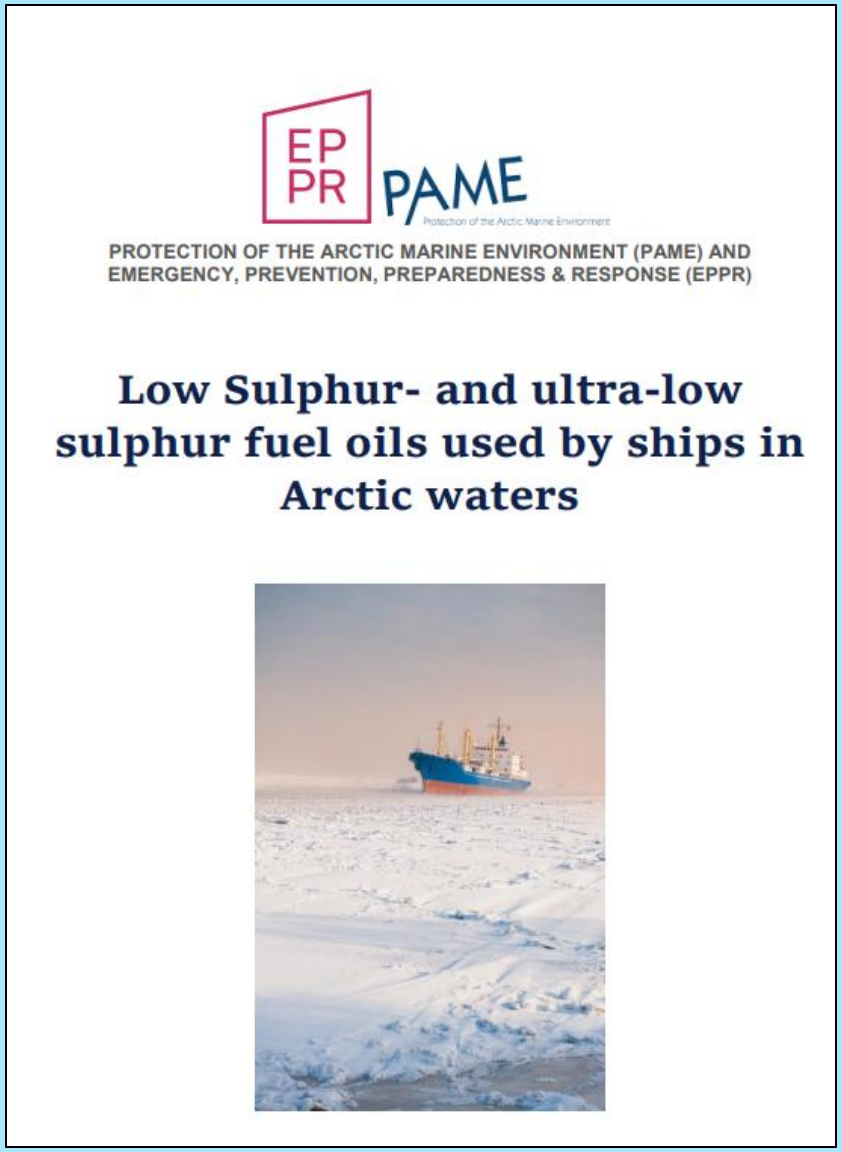
- **WP1: Which fuels are used on-board ships sailing in Arctic waters?**
  - Properties and characteristics
- **WP2: Industry involvement workshop (Planned for May 2023)**
  - *Why* fuel oil that fill the same gap in the fuel market (substitutes) have different level of toxicity and so different characteristics ? Is it about the crude oil, the refinery processes or additive etc.?
  - Measures (Low hanging fruits) that easily can be taken to improve the properties?
- **WP3: Fuel oil testing procedures/methodology**
  - ✓ Agree on a common methodology for analyzing fuel oil in different laboratories (to get comparable results)
  - ✓ Inter-calibration of the laboratories using four Low Sulphur fuels (Methodology agreed)
  - ✓ Decided on 10 – 12 fuel oils to be collected for testing
  - Collect samples of the most common fuels
- **WP4 Fate and behavior testing (Laboratories)**
- **WP5 Toxicity testing (Laboratories)**

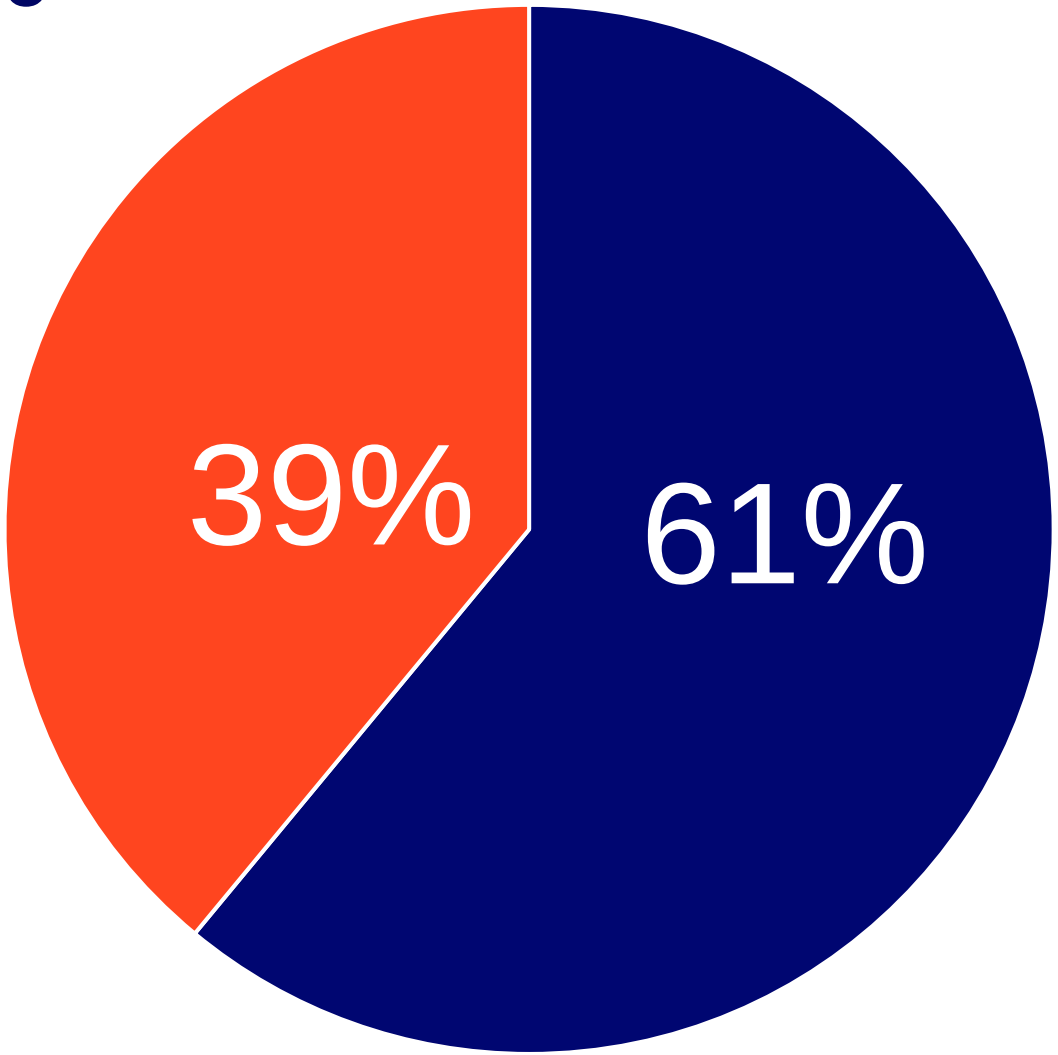
Key findings



Distillates and HFO in the Arctic

Residual fuels

Distillates



Method used in the WP1 report

AIS analysis of ship traffic in the Arctic-area

Collection of bunker fuel oil data from VPS

Processing of data and geographical distribution of results

Report

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DEFINITIONS

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- **Pour Point: The temperature when an oil solidifies**

- **Viscosity: Oil's resistance to flow (thickness)**

VLSFO

HFO

Chemical and physical properties

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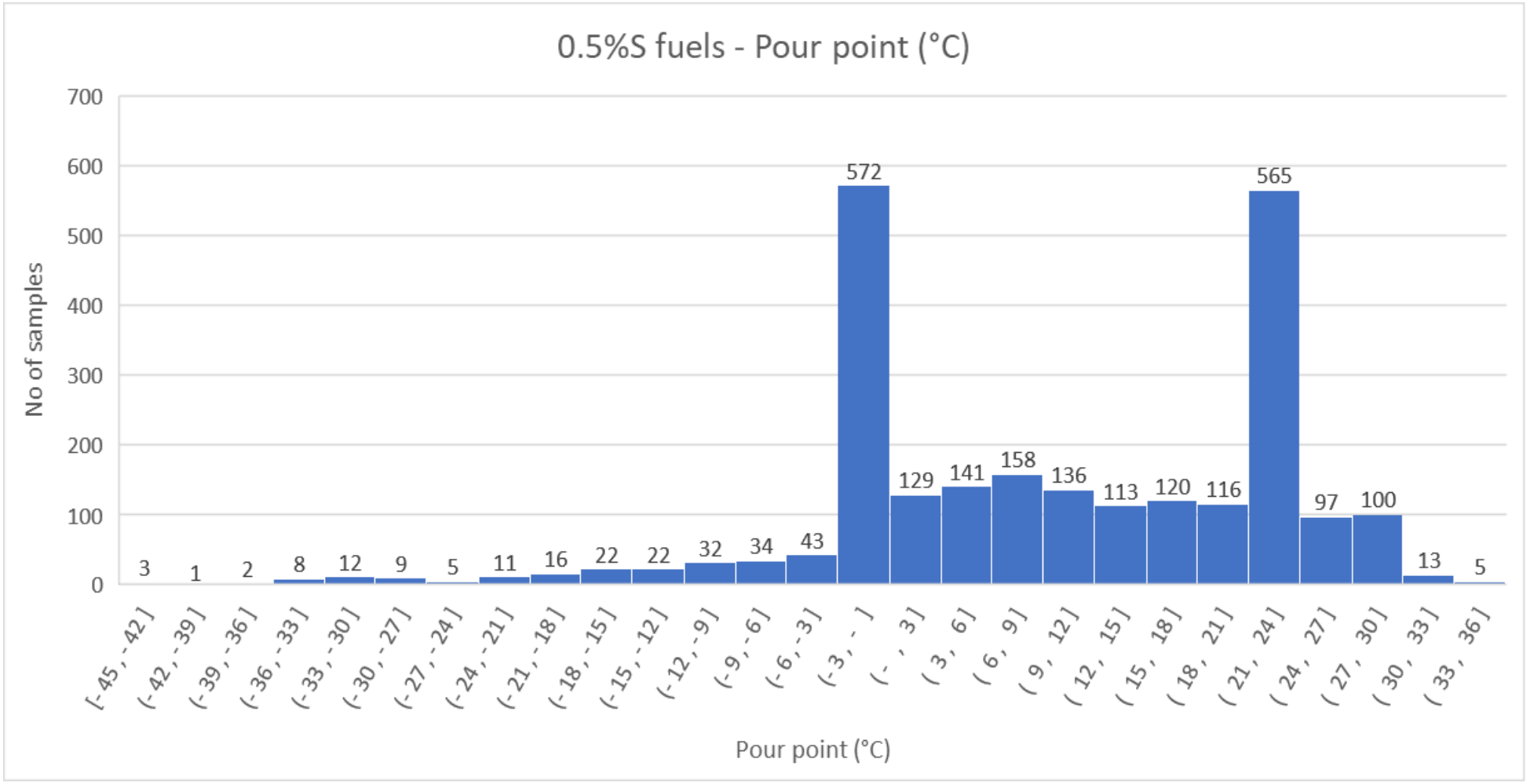
Great variation in the properties of the oils!!

- Pour point between -45°C and + 36°C

- General observations:
  - Some fuel oils are not liquid at room temperature
  - Some fuel samples acquire high viscosity during weathering
  - Oil lumps can be sticky, especially when heated from for example the sunshine
  - Different elasticity

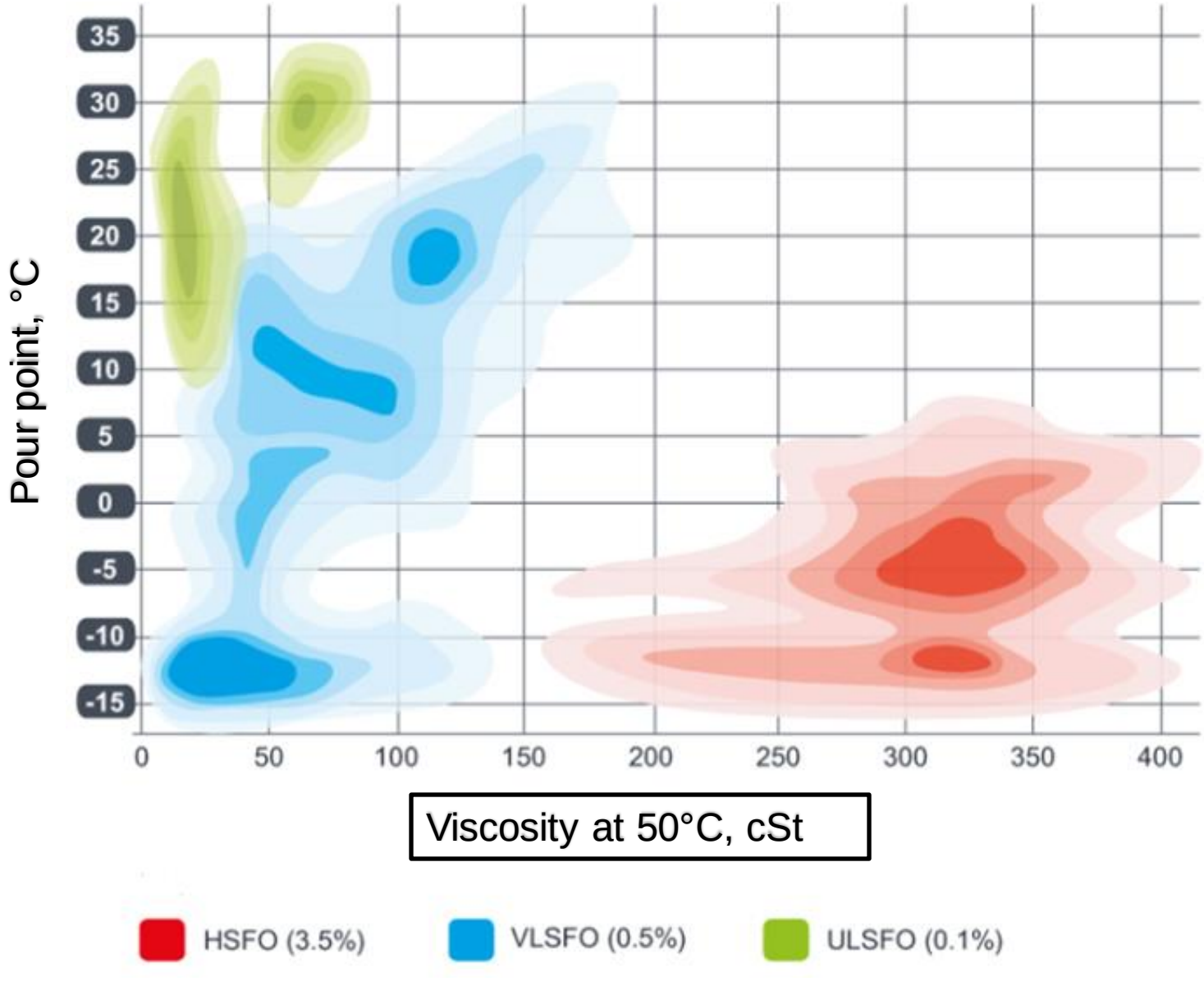
High pour point, problematic in the Arctic (2400 fuel samples analyzed)



Comparison of HSFO and VLSFO (4800 samples)

	2021 VLSFO	2018 HSFO
Viscosity at 50°C, cST	99	318
Density, kg/m3	938	988
Pour point > 21°C	29%	2%
Sulphur content	0,45	2,61

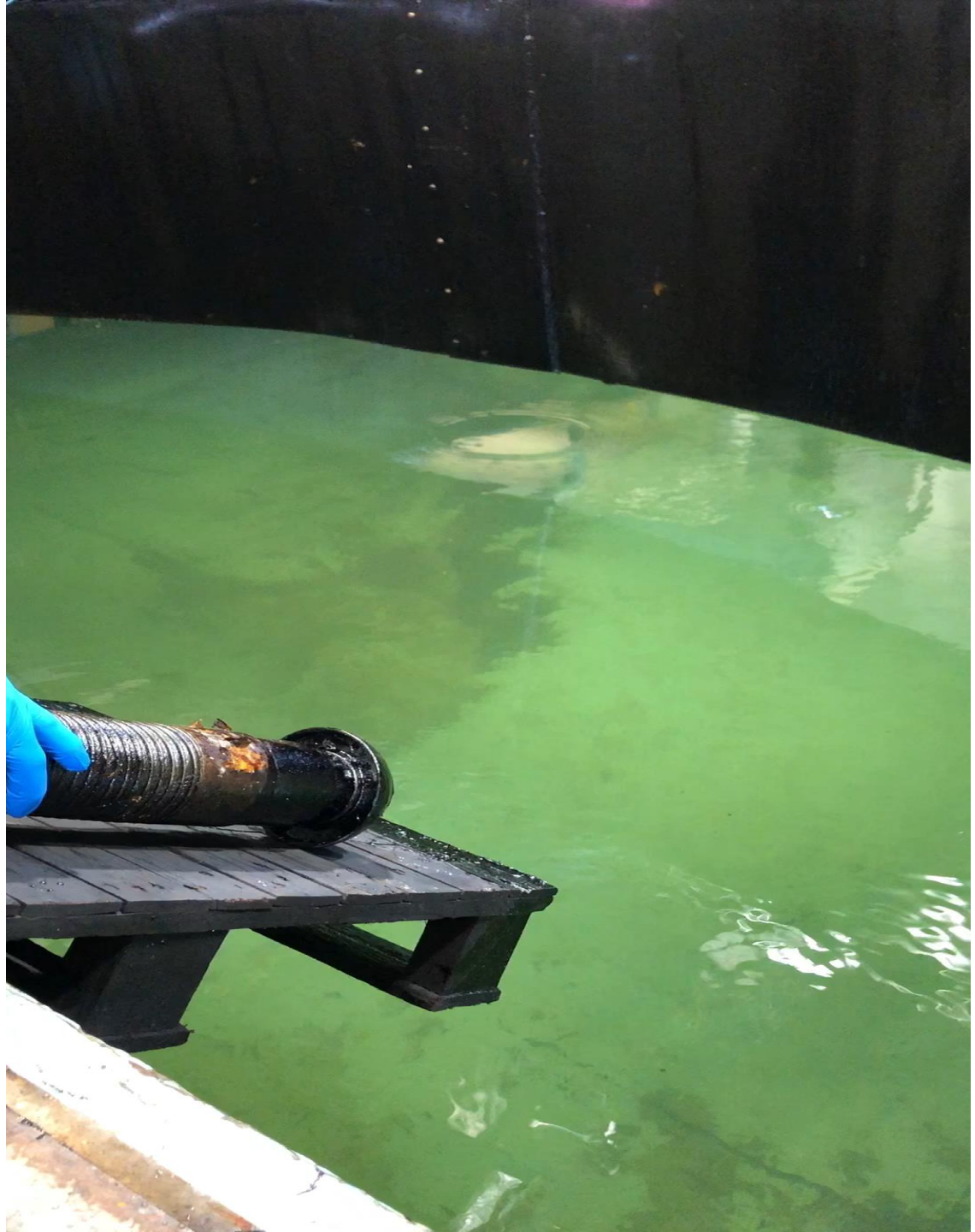
Comparison of HSFO, VLSFO and ULSFO



The efficiency of mechanical oil recovery and dispersion is considerable reduced

Testing of VLSFO

The fuel oil solidifies at 11 degrees Celsius sea temperature



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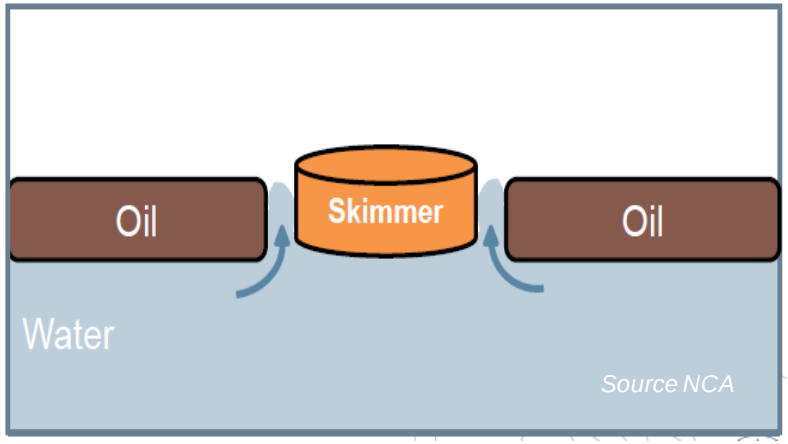
Mechanical oil uptake

Great variation in oil properties

- Challenges associated with high Pour point/Solidification point
- Flow properties



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Problem of VLSFO: Skimmers rarely work

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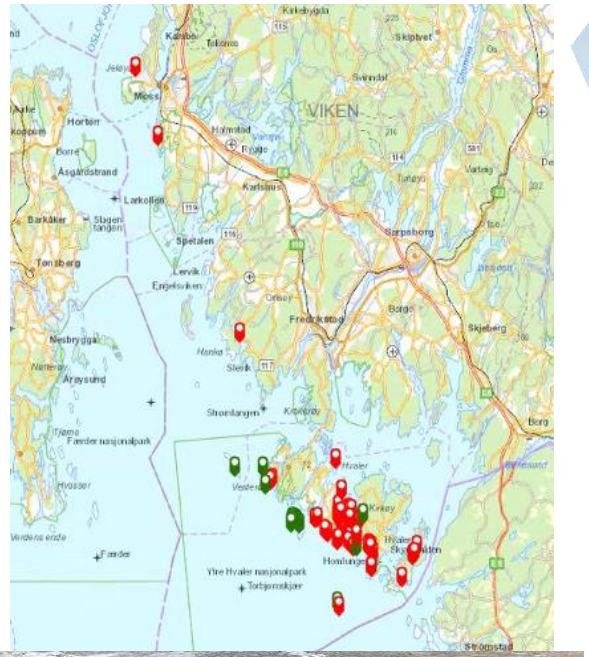
Small VLSFO spill from Sweden, spring of 2022



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IMO Heavy fuel oil ban in Arctic waters (July 1, 2024)

Complete HFO ban would only come into effect in mid-2029

Definition for Heavy Fuel Oil

Marpol Annex I - Residual Heavy Fuel Oil (HFO) - bunker fuel or residual fuel Oil

- Fuel oils having either a density at 15ºC higher than 900 kg/ m3 or a kinematic viscosity at 50 °C higher than 180 mm2/s (Cst)

Arctic HFO ban:

MARPOL Annex I, decided during MEPC 75:

The Arctic HFO ban covers fuel oils having

- a density at 15°C higher than 900 kg/m3
- or a kinematic viscosity at 50°C higher than 180 mm2/s (Cst).

Most VLSFO's used by ships in the Arctic are affected by the HFO ban (2400 samples)

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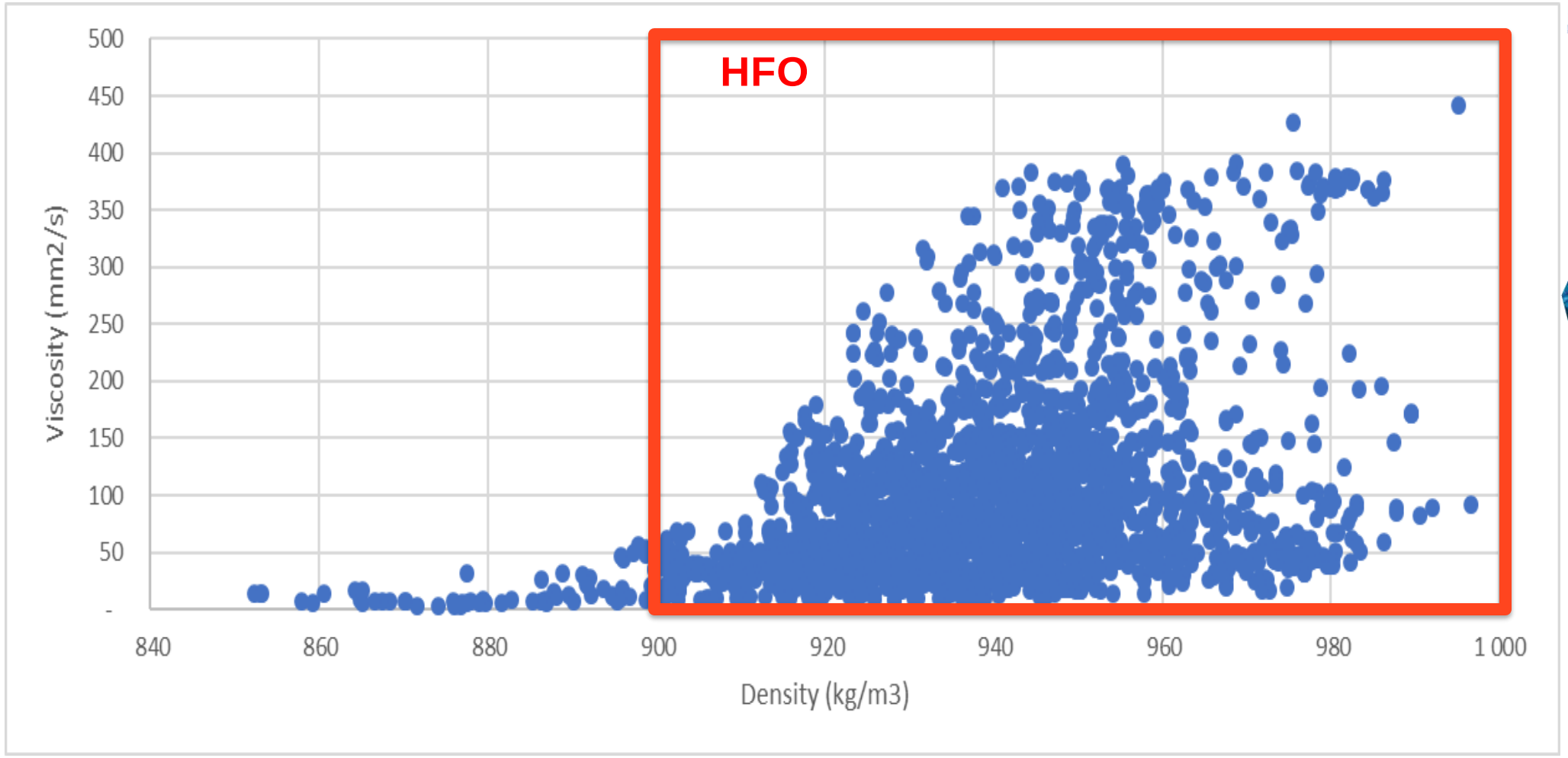

Arctic “dream” residual fuel oil is achievable

Such fuel oil should have:

- Pour point under 0 degrees Celsius, in order for skimmers to work better than today
- Low toxicity, to limit the consequences for aquatic life
- Optimal properties for Degradation by microalgae-based bacteria
  - because we to a great extent have to depend on the nature's self-cleansing ability in the Arctic (A low pour point is a prerequisite)

✓ Such fuel oil exists today and they can most likely be improved further

✓ Such fuel oil it is probably not more expensive to produce

✓ Best practice fuel blending procedures for Arctic residual fuel should be drawn up

The Norwegian Coastal Administration and the Norwegian Maritime Directorate cooperate on IMO regulation

Proposal: Maximum allowed Pour point is proposed to be regulated to 0 degree Celsius in the Arctic. Pour point is suggested to be included in the HFO definition

Next Steps:

- The proposal received general support, but it was agreed that a more technically detailed assessment of the proposal was necessary (expected)
- The proposal will be sent to a technical subcommittee for further discussions (PPR 10 will meet in April next year)
- PPR makes a recommendation to the Environmental Committee whether the proposal should be on the agenda or not (MEPC 80 meets in July next year).
- If the proposal is on the agenda, it will happen at PPR 11 in 2024 at the earliest, possibly later
- Norway is considering to submit more information and a more detailed (revised?) proposal to PPR 10
- Among those who were most skeptical were representatives from the oil industry, such as ISO, IBIA and IPIECA.

Conclusion

- Great variation in oil properties
- Oil spill preparedness services must today be able to handle oil with very different properties
- High solidification point and flow properties create great challenges for existing oil preparedness and response

Thank you!

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