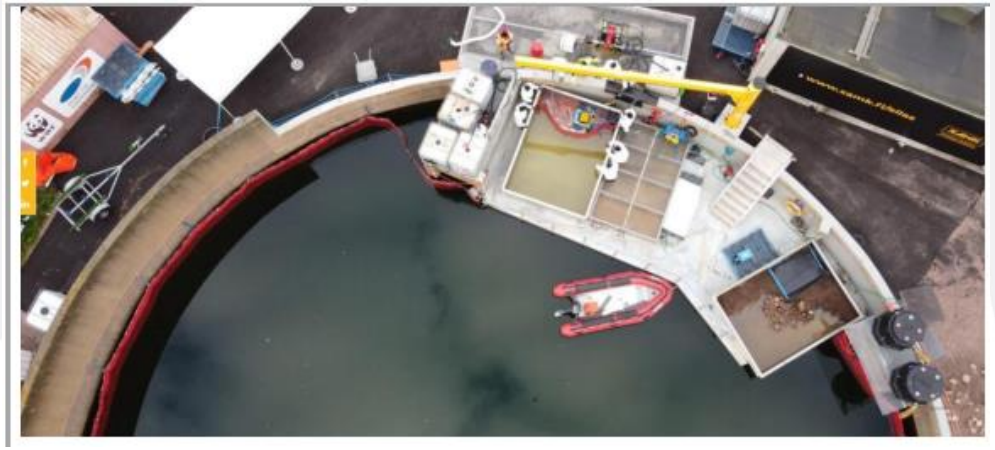
Test in cold conditions in Finland

Test procedure Finland

18.4.2024

Additional tests in cold environment

- Main tests are done in Norway, but FBG offers a possibility to perform tests also in cold conditions in Kotka, Finland
  - Test area is owned by the South-Eastern University of Applied Science (XAMK)
- Background:
  - Atleast coastline of the Northern Baltic Sea has ice conditions in every winter
  - Surface sea temperature is cold in every winter (near 0 °C)
- Test area is outside pool so conditions are…?
  - Air temperature "between" -30 – +10 °C



Picture: XAMK.fi

Picture: Vayla.fi (Winter Navigation)

Test procedure 1 (2)

Time:

- 2-3 days for testing (week 7 in 2025)

Oil type:

- The chosen oil emulsion is determined based on which LSFOs the IMAROS2 project can provide. Only one sample will be tested in Finland.

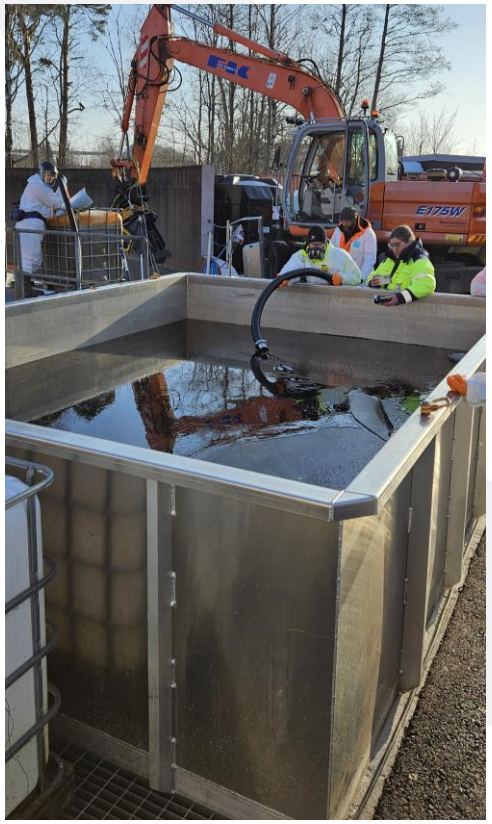
Objective of the test:

- The approach of this procedure to test the capacity and efficiency of the oil skimmers capacity *in broken ice*

Test plan:

- Will be drawn up describing the purpose and planned implementation of the individual test. The test plan should also describe all configurations and settings, as well as include forms to document the results along the way.

Test procedure 2 (2)



Facilities:

- 12 square metre steel tank
- Water temperature near 0 °C, possible ice coverage, broken ice

Conducting tests:

- Test is conducted 2-3 times (flexible)
- Depending on used equipment's and conditions

- Detailed test procedure will be done with possible manufacture
  - If no interested, FBG will do test with our own equipment
  - Practical preparations will be made before the test in co-operation
    - Possible need for excavator, other equipments, facilities etc.

The bucket skimmer performance test was conducted 4.–5.3.2024

- Experiments were carried out in partly cloudy weather with air temperatures -2 - +2 °C
- Two sites were prepared for testing:
  - S1 – A 9 square metre area was delimited with plywood boards on the ice surface of the main basin. The size of the area was determined on the basis of the reach of the excavator's hydraulic arm.
  - S2 - A 12 square metre steel tank was filled with water and left to freeze for over a week. 10 mm ice was formed.
- The purpose of the test was to evaluate the recovery performance of an excavator operated brush bucket skimmer in ice conditions.
- Two types of oil were used to gain information on possible performance differences: Marine Diesel Oil DMB grade (ULFSO) and Residual Fuel Oil (VLSFO).
- The oils were recovered from a solid ice surface and from broken ice. Test included also measurements for occupational safety.

Conclusion

- The tests demonstrated that the brush bucket skimmer is capable of recovering Residual Fuel Oil (VLSFO) from water and, only down to a certain oil layer thickness from the ice surface despite the availability of oil in bulk.
- In contrast, the bucket skimmer did not recover Marine Diesel Oil (ULSFO). A bucket skimmer alone was not enough to remove the oil from the ice, and other methods had to be used to accomplish the task.
- This finding contradicted the assumption based on the manufacturer's description (for similar equipment) that the bucket skimmer is suitable for handling both light and heavy viscous oils. The suitability for different types of oil is said to be based on changing the rotation direction. As this model was not operable in both directions, this suitability does not apply to this skimmer.

RAJA
RAJAVARTIOLAITOS