

Oil Spill Containment by use of Air Bubbles

March 2015



Objective: To investigate the potential of using wide bubble barriers as an oil spill countermeasure.

Curtains of air-bubbles are turning out to be a new method of fighting oil-spills. The bubbles gather up the oil efficiently, even in winds and strong currents, and keep it together in a “pool”.

Previously performed laboratory and field tests:

- Initial tests in SINTEF’s oil weathering flume tank
- Small scale field tests of a towed bubble raft ahead of an oil boom over the natural oil seep fields near Santa Barbara, California
- Large scale tests at SINTEF’s flume tank at The North Sea Centre in Hirtshals, Denmark
- Meso scale tests with oil in SINTEF’s seawater basin

Full scale tests in the tidal sound of Skarnsundet in Trondheimsfjorden

- Measured current amplitudes of more than 1 m/s (2 knots)
- Predominant semi-diurnal tidal current (6 h 12 min)
- Mean tidal spring range of 250 cm

The bubble raft

- Constructed from trusses of galvanized pipe coupling
- 12 m long and 1.5 m wide
- 5 pressure pipes of 32 mm PE
- Each pipe was perforated by 1.5 mm diameter holes every 10 cm
- Two diesel compressors delivering a maximum air flux of 13 Nm³/min
- Depth capacity of 2.4 m

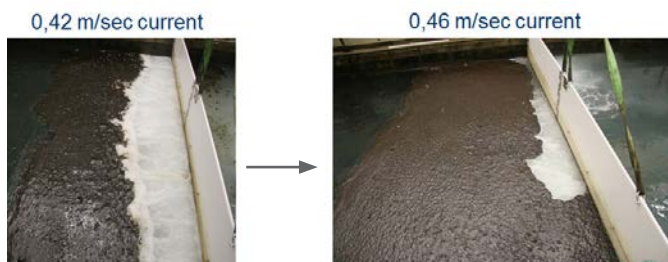
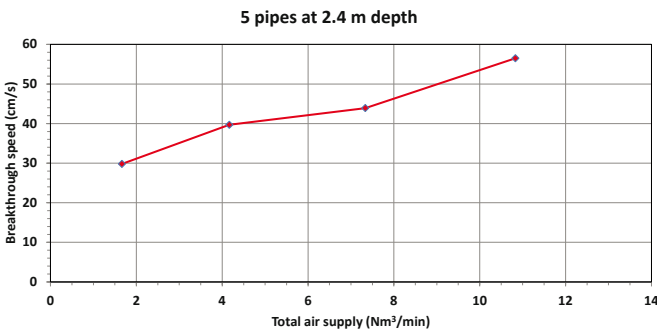


Prevailing scepticism to the bubble curtain efficiency as an oil spill countermeasure in strong currents:

- " ineffective for oil spill retention, but may provide spill deflection in a current"
- " has one serious mode of failure that must be considered in a serious analysis and that is in tidal current"
- "At water current speeds exceeding one foot per second (30 cm/s), the pneumatic barrier no longer functions effectively, limiting deployable sites" (Wikipedia)



A proof to the contrary was given by the full scale tests in Skarnsundet where an air flux of 13 Nm³/min distributed through a 5-sparger grating at 2.4 m depth functioned effectively at water currents exceeding 1 knot (50 cm/s).



Breakthrough (BT) – Air flow is kept constant while the current is gradually increased. The current where oil significantly escape through the boom/barrier is recorded.

Retention of oil by air bubbles. From SINTEF's seawater basin tests with oil.

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