The advantage of pneumatic oil barriers

Hydrotechnik Lubeck GmbH, Lubeck, Germany

Due to constantly growing environmental awareness and the resulting obligation to protect the world around us (in this case the water) against pollution, a countless variety of barriers have been developed. Most of these barriers consist of floating booms which contain oil and floating debris within their sub-surface portion (the skirt).

During an emergency situation where the floating boom has to be transported to the place of need, generally there is no alternative to a floating boom. However, for the protection of permanent installations, such as harbour entrances, tanker berths and water intakes, pneumatic oil barriers are an alternative with many advantages over conventional floating booms.

Pneumatic oil barriers

The pneumatic oil barrier generates a current on the water's surface with sufficient velocity to stop oil from overrunning it. The current is produced by rising air bubbles which cause an upward water flow. When this vertical flow reaches the surface of the water it divides into two horizontal currents which flow away from the vertical stream of bubbles (see Figure 1).

The air for the bubbles is distributed along the barrier line by special nozzle pipes which are placed on the seabed. A compressor station located on the shore generates the compressed air for the pneumatic oil (bubble) barrier. The service pressure generated by the compressor station has to be higher than the hydrostatic pressure of the water.

During extensive practical tests carried out by the University of Hannover, the results showed that compressed air systems can retain thick oil layers.

The following products were retained during the tests:

- 52 mm petrol
- 70 mm gas oil
- 85 mm raw oil
- 167 mm machine oil

To ensure that the barrier will meet its purpose all local conditions have to be taken into consideration, such as type of oil, water depth, influence of wind and velocity of water current.

The following items are required for the operation of a pneumatic oil barrier:

1) Compressed air supplied by a compressor station or by a works supply system.
2) Control of the compressed air via suitable valves
3) Supply air pipes, nozzle pipes and drain pipes with fastenings and weights as required
4) Alarm system for damage to the nozzle pipe

Main advantages of pneumatic oil barriers

Handling

To close the entrance of a harbour or a seawater intake with a floating boom needs equipment, manpower and time. In bad weather or during the night it may even be impossible to deploy the floating boom. In any case it is dangerous for the people doing the deployment.

To close the same entrance with a pneumatic oil barrier needs just a few minutes and a thumb to push the start button. For example to close a harbour entrance of 160m takes two minutes, to close the whole 1,000m wide entrance of a bay takes 10 minutes.

The time needed to deploy a barrier is important for oil ports which handle a lot of tankers. If you have to position the floating boom anew after every ship movement, it would be a constant job for a crew of three to four people

Maintenance

Every floating object needs maintenance due to the harsh conditions in the marine environment and the rough handling it sometimes receives. If the pneumatic oil barrier is constructed with the right materials, it needs nearly no maintenance. The nozzle pipes are very thick walled HDPE pipes and the special nozzles which are acting as a check valve prevent dirt or mud from entering into the pipe. Thus, only the compressors which are on the shore have to be maintained. As for the nozzle pipe, its sole maintenance requirement is to keep the barrier running once a week for an hour.

Because of the nozzles, the barrier even operates when the nozzle pipe is covered completely with mud. In the port of Hamburg the barriers have to be removed once a year for dredging. At that time the nozzle pipe is covered with 1.5 m of mud yet is still operational.

Operational life time

Because all components are either in a building on shore or on the seabed under water, environmental factors such as wind, waves, sun or ice have no an effect on the barrier. In Europe there are Hydrotechnik pneumatic oil barriers which have been in operation for more than 30 years, and in the Gulf region barriers have been in operation for more than 20 years.

Special features

Even though there are fire resistant floating booms, no floating boom can stand the conditions of a fire better than a pneumatic oil barrier as all parts are below the water. The pneumatic oil barrier can also do its job when the water is covered with floes of ice, whereas any floating boom would be destroyed.

It can be said, that as a permanent installation, the pneumatic oil barrier can do the same things as a floating boom only faster, for a much longer period and without manpower.

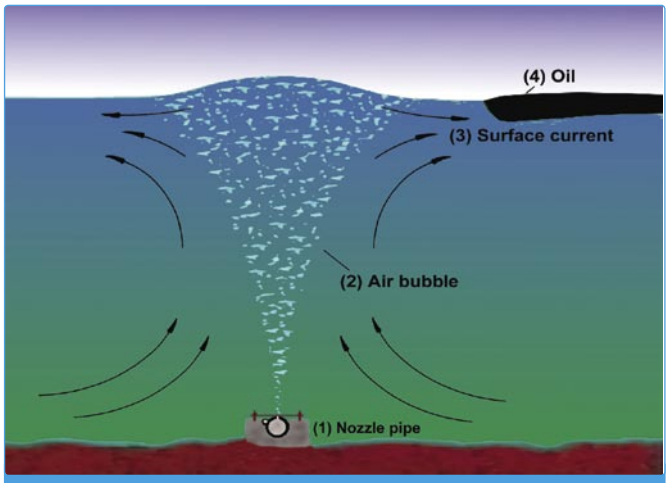

Figure 1. The pneumatic oil barrier generates a current on the water's surface with sufficient velocity to stop oil from overrunning it.

Pneumatic oil barrier in action stopping oil on the water surface.

Examples of standard installations

Oil Port: Kattwykhafen Hamburg

Task: To close the harbour entrance of 470m within four minutes. The owner of the port contacted many manufactures of floating booms but not one could guaranty the closing of the harbour entrance under all weather conditions within four minutes. A pneumatic oil barrier was designed and built by Hydrotechnik. During the commissioning, aside from checking the generated current, the time it took the barrier to close the harbour entrance was also measured. The barrier was closed in three minutes.

Sea water intake

In this example the intake channel is 700m long and 220m wide. The breakwater dams of the intake channel are made out of huge boulders. If spilled oil were allowed to enter the channel and enter the gaps between the boulder it would be impossible to clean the channel and the desalination plant of 760,000 m^3/day, and it would be no longer operational.

ABOUT THE COMPANY

Hydrotechnik was founded in 1972. Since its inception it has been working in the field of oil spill protection. Hydrotechnik is the sole supplier of oil-booms to the German Army and has worked on many oil-spill recovery projects around the world. The bubble barriers were developed by the founder of the company. Hydrotechnik has built more than 140 bubble barriers thus far. All installations are done by Hydrotechnik's own personnel and divers.

ENQUIRIES

Grootkoppel 33
23566 Lübeck
Germany

Tel: +49 451 65 1 75
Fax: +49 451 62 37 44
Email: info@hydrotechnik-luebeck.de
Website: www.hydrotechnik-luebeck.de