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• Spills

Spill following a ship collision (*Alyarmouk* oil tanker, Singapore Strait)

On 2nd January 2015, the Libyan oil tanker *Alyarmouk* (116,039 GT) collided with the Singapore-flagged bulk carrier *Sinar Kapuas*, some 20 km off the island of Pedra Branca, at the eastern end of the Singapore Strait.

The oil tanker's crew reported that one of its damaged tanks was leaking crude oil (from the Indonesian Madura field) into the sea. Aerial surveys by helicopter were immediately organised by the Maritime and Port Authority (MPA) of Singapore. The Malaysian and Indonesian authorities were notified by MPA, in compliance with the relevant agreements relating to oil pollution in the Straits of Malacca and Singapore.

The response at sea was coordinated by MPA. The same day, the polluter contracted 2 response companies, which immediately deployed 4 vessels, equipped with spill response equipment, on site. The operations are reported to have included mechanical recovery and dispersant application on certain slicks. The oil tanker's P&I club also mobilised their technical expert (ITOPF[1]) to help to guide the response strategy.

According to the ship manager V Ships UK Ltd, 4,500 tonnes of Madura crude oil was released at sea. No significant quantities of oil were reported to come ashore, due to the combined action of response operations, favourable drift and natural degradation of the oil at sea.

In addition to the daily aerial surveys, satellite images were used to track the spread of the spill on a larger scale. The aim was to identify the risks of the oil reaching the coast, in particular in the popular tourist areas of Bintan Island (in the Riau Islands Province of Indonesia, which is also home to populations of endangered species of Chelonii – the green sea turtle and the hawksbill sea turtle). Two days after the incident, no oil appeared liable to threaten the coastline and the slicks appeared scattered. This was confirmed by aerial surveys.

Despite the region's sensitivity (tourism, environment) and the scale of the spill, this incident did not generate any significant impact, and according to MPA, traffic in the port and Strait of Singapore was unaffected.

Marine diesel spill on the coast: grounding of the *Lysblink Seaways* (Kilchoan, Scotland)

Early on the morning of 18th February 2015, the general cargo vessel *Lysblink Seaways* ran aground at full speed near Kilchoan, on the Ardnamurchan peninsula (western Scotland), while on passage from Belfast (Ireland) to Skogn (Norway).

The vessel, grounded on the rocky foreshore, was exposed to adverse sea and weather conditions (strong wind, swell and waves). The hull was deformed and the structure was breached, including some fuel tanks, resulting in the release of an estimated 25 tonnes of marine gas oil. In accordance with the UK National Contingency Plan for marine pollution from shipping, the Secretary of State's representative (SOSREP) assumed overall control of the incident management, including the implementation of vessel salvage actions as well as pollution prevention actions, carried out jointly with the Maritime and Coastguard Agency (MCA).

Salvors were appointed and salvage tugs were sent to the scene within 24 hours of the accident. Meanwhile, the weather conditions made the implementation of recovery operations both difficult and unnecessary, as the gas oil was rapidly dissolving thanks to the strong hydrodynamics in the area.

The salvors were assessing the technical options for recovering the remaining gas oil from the vessel's tanks when the ship unexpectedly refloated on the evening of 19th February. The vessel was anchored and the salvors carried out work to prevent further pollution. On 5th March, the vessel was towed to Greenock, as directed by the Maritime and Coastguard Agency. Following a hull survey in dry dock, the *Lysblink Seaways* was declared a constructive total loss and was subsequently scrapped.

In its accident report, the Marine Accident Investigation Branch (MAIB) concluded that the incident was linked to a loss of "situational awareness" by the officer of the watch due to the effects of alcohol consumption and the crew's disregard of the owner's zero alcohol policy which, had it been

[1] International Tanker Owners Pollution Federation

effectively administered and monitored, might have "prevented the development of a culture in which the chief officer considered it acceptable to consume alcohol before his bridge watch".

For further information:
https://assets.digital.cabinet-office.gov.uk/media/564c571840f0b674d6000033/MAIBInvReport25_2015.pdf

Fire and sinking of the factory trawler *Oleg Naydenov* (off the Canary Islands, Spain)

On 11th April 2015, a fire broke out, the reason for which remains unspecified in our information sources, onboard the Russian trawler (136 m long) *Oleg Naydenov*, berthed in the Spanish port of Las Palmas de Gran Canaria (Canary Islands).

After the 72 crew members had been evacuated, the blazing factory ship was towed out of the port by the port authority. Although the fire had been brought under control by SASEMAR (*Sociedad Estatal de Salvamento y Seguridad Marítima*), the *Oleg Naydenov* sank on the evening of 14th April in waters 2,700 m deep, around 24 km south of Punta Maspalomas (southern tip of Gran Canaria). The vessel was carrying 1,410 m^3 of bunker fuel, 60 m^3 of lubricants and 30 m^3 of diesel.

Oil was observed at the water surface during aerial surveys, initiated the following day by SASEMAR, indicating leaks of oil from the wreck.

Two days after the incident, the spill stretched over a surface area of 12 km^2. The thickest layers were located over 60 km south-west of the spill site, indicating that they were drifting out to sea without causing any direct threat to the coastline, and were heading out of the waters under Spanish jurisdiction. Based on these surveys, the authorities estimated the quantity of oil at the surface (40 km-long slick) at between 300 and 1,000 m^3.

Three tugs and 2 planes were sent to the scene, however the sea was too rough to contain and recover the drifting oil, and chemical dispersion was not considered appropriate[2].

The priority action therefore lay in controlling the leak. SASEMAR mobilised 2 vessels and commissioned a subsea survey involving the use of remotely operated vehicles (ROVs) to inspect the wreck. A first ROV identified 3 breaches, with an estimated fuel leak rate of 5 to 10 litres/hour. A second ROV was mobilised on 4th May, to assess the technical options for recovering the oil remaining in the vessel's tanks. The companies Ardent (created following the merger of Titan Salvage and Svitzer) and Ardentia Marine (Spanish firm specialised in subsea intervention) were contracted in mid-June to conduct these operations. These companies proposed to collect the upwelling oil using containment systems (domes) positioned above the leaks, in store it in submerged storage tanks which would rise to the surface as they were filled (demonstration video of the process available online).

Oil washed up on the west coast[3] of Gran Canaria a week after the *Oleg Naydenov* sank, but the authorities did not confirm the link with the ship, in particular given that according to aerial surveys and the available satellite images the oil was drifting in the opposite direction (oil spotted near to the wreck drifting southwards, off Western Sahara)[4].

An investigation into the origin of the fire was opened. Aside from this initiative, the Spanish authorities were criticised (in particular by the residents of the Canary Islands and various environmental associations) on the management of the incident, in view of the decision to tow the ship out to sea and the difficulties generated in terms of the response to a potential spill, in an ecologically and economically sensitive context, and which (even if the case was quite different) revived memories of the case of the *Prestige* oil tanker in 2002.

Ammonium nitrate spill following the sinking of a barge (coast of Puntarenas, Costa Rica)

On 2nd May, 150 metres off the coast of Puntarenas (Gulf of Nicoya, Costa Rica), a barge owned by Fertica (agricultural fertiliser manufacturer) capsized for an unspecified reason, and sank with its cargo of 180 tonnes of ammonium nitrate onboard. The nitrogen fertiliser, a highly water-soluble powder, dissolved rapidly in the environment.

Therefore, given its solubility and expected dilution, no spill response actions were considered

[2] Certain press sources make mention of mechanical agitation operations, for which we have no detailed information if such was the case.

[3] Veneguera, Tasarte, Taurito, Güigüi nature reserve

[4] According to various press sources, the Spanish authorities also took seawater samples to check the identity of the oil washing up on the shore and the upwellings at sea; we have no knowledge of the results of these tests.

necessary. To prevent any potential health risks, Costa Rica's National Emergency Commission (CNE) nevertheless temporarily banned marine activities along a 100 km-stretch of beaches in the Puntarenas region. This is a very popular tourist area and, while the chemical did not generate any specific toxic risk for the environment and has low persistence (rapidly biodegraded), this precaution was mainly based on the potential risk of eye, skin or respiratory irritation, as indicated in the material safety datasheets – although in this case the risk was relatively limited (as the risk of prolonged contact or contact with massive quantities of the chemical was low).

Water quality monitoring, and surveillance of any algal blooms, was implemented to determine when the ban could be lifted. Initially, a 'red' alert was issued (ban on bathing), which was downgraded 2 days later to 'yellow' (fishing ban) for a further 72 hours, pending further analysis, then the ban was finally lifted. No impact on human health was reported. In terms of the environment, a few dead fish were spotted near the spill point in the first few hours following the spill.

The captain of the barge blamed the accident on adverse weather conditions. With no ad hoc terminal in the region, the barge transferred fertiliser between the local Fertica factory and a cargo vessel anchored a few hundred metres offshore.

Potash fertiliser spill in a protected mangrove: *Jabalenoor* spill (Bangladesh)

On 5th May, in the delta of Bengal, the bulk carrier *Jabalenoor*, loaded with 200 tonnes of potash fertiliser, ran aground, for an unspecified reason, in the Bhola River, in the north-east of the Sundarbans mangrove (Bangladesh), a natural area protected under the RAMSAR Convention and as a UNESCO World Heritage site.

The vessel was stuck on a shoal and almost entirely submerged. Shortly after the grounding, the wreck broke due to the combined influence of the tidal currents and the strain exerted on the vessel during the failed attempts to tow the vessel in order to refloat it. Vessels (unspecified) were also deployed to try to collect the cargo of the Jabalenoor, but these attempts were unsuccessful due to the tidal currents.

The water-soluble cargo dissolved in the environment, and could be seen in the form of a redish tinge in the river.

As with the incident involving the Fertica barge (see above), options for controlling and recovering this dissolved spill were lacking. Despite the site's ecological sensitivity (highlighted by the oil spill caused by the *Southern Star 7* in December 2014; see LTML n°40), no visible harmful effects on the environment were report, probably thanks to the rapid dilution of the fertiliser in this vast estuary.

Coastal pollution from an underground pipeline (Plains All American Pipeline Line 901, Refugio State Beach, Santa Barbara, US)

Late morning on 19th May 2015, in the County of Santa Barbara (US), a crude oil leak occurred from an underground pipeline (Line 901), operated by Plains All American Pipeline, L.P., running from Las Flores to Gaviota, California.

A breach opened up at a point of corrosion in the line, where the wall thickness had decreased by around 75%[5]. The pipeline (24 inches/61 cm in diameter and constructed in 1987) transports crude oil from nearby extraction wells to storage facilities in southern California.

Left: Close-up of the breach in the line (Source: PHMSA); Right: Visible crude oil leak at a drainage culvert (University of California Santa Barbara)

The incident occurred around 100 m inland. The crude oil rapidly reached the Pacific coast via a drainage culvert running under the coastal highway and flowed out of an outfall at the northern end

[5] This weak point is believed to have ruptured due to a sudden rise in pressure following maintenance work. A Preliminary Factual Report was released in February 2016 by the Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety and can be downloaded at: http://capps.house.gov/sites/capps.house.gov/files/documents/PHMSA%20Preliminary%20Factual.pdf

of the protected Refugio State Beach. The oil spread over the beach and the water surface. Local residents notified the Santa Barbara County Fire Department, who carried out initial investigations on site and identified the outfall just minutes after variations in pressure were detected and the pipe was shut down remotely.

It was not until 3 hours after the incident that the operator notified the federal authorities via the US Coast Guard National Response Center (NRC). Faced with criticism on this point, Plains justified this choice by stating that the workers in the field were busy dealing with the emergency. Indeed the workers, alerted by state park staff, implemented the initial measures to stop the leak, notably by identifying the exact location of the spill point and its pathway and by plugging the culvert (in particular with sand bags).

The quantity of oil released from the pipe[6] was later estimated by Plains at 400 to 540 m^3. The share to have reached the shoreline was initially estimated at 100 m^3, but was later revised to 400 m^3.

The day after the incident, California State Parks banned access to Refugio State Beach and El Capitán State Beach[7], and an environmental state of emergency was temporarily declared for the state of California and the county of Santa Barbara. Meanwhile, pending the results of analysis tests on fish samples, the Department of Fish and Wildlife (advised by the Office of Environmental Health Hazard Assessment, OEHHA) banned fishing in a 800 m-wide band, along a stretch of coastline comprising Refugio State Beach. The following day, further offshore, a 35 km by 10 km area was also closed to fishing after drifting slicks had been spotted. The various fishing bans were lifted between 19th and 29th June.

As is commonly the case in the United States, a Unified Command (UC) was immediately established, coordinated by the US Coast Guard and comprising representatives of the relevant pubic bodies, at various levels of the administrative organisation (local, state, federal agencies...)[8], as well as the operator (Plains and its contractors).

Airborne and shipborne surveys were carried out in order to monitor the spread of the spill during clean-up operations. Clean-up operations began the day after the incident with over 250 people, from public and private organisations, and were carried out continuously over the first days. This number grew steadily, reaching over 1000 by the beginning of June.

At the spill source, two days after the spill, the operator began to flush out the culvert which passed under the highway, then excavated the soil to reveal the leaking section of pipe and remove the polluted soil.

22/05/2015: Excavating soil near to the spill point (Source: USCG)

A continuous monitoring programme for atmospheric contamination, validated by the UC, was implemented in order to ensure there were no health risks for the public and for response personnel and the results were interpreted by a panel of experts from various agencies.

21/5/15: Pair trawling of floating booms off Santa Barbara (Source: USCG)

Inshore, over 15 vessels were immediately mobilised to recover the floating oil using containment booms and skimmers. These vessels included fishing boats fitted out as Vessels of Opportunity (VOOs), pre-contracted by the local specialised company Clean Seas and whose crew members received ad hoc training in containment and recovery operations Hazardous Waste Emergency Operations Response – HAZWOPER – Training)[9].

According to the authorities in charge of supervising these operations, the spread of the crude oil at the surface and the agitation of the water reduced the efficiency of these operations. However the combination of the hydrodynamics, sunshine and water temperature promoted evaporation and

[6] which, at the time of the incident, was operating at a flow rate of 320 m^3 according to Plains.

[7] These bans remained in place until 17th and 26th June respectively.

[8] Including the United States Coast Guard, the U.S. Environmental Protection Agency, the California Department of Fish and Wildlife and its Office of Spill Prevention and Response, and the Santa Barbara Office of Emergency Management.

[9] The crews' skills (response equipment deployment) were regularly refreshed through training/exercises each year.

natural dispersion processes. No floating oil was reported after 3rd June, and the vessels and equipment were gradually demobilised from this date, and decontaminated at a specific site in Ventura Harbor.

On the shoreline, near the outfall, over 900 m of floating booms were deployed from the day after the incident, as well as sorbent booms, both to prevent the oil from spreading and to protect sensitive sites (areas of vegetation on the upper beach for instance). By early July, over 3,200 m of containment and sorbent booms had been laid.

Assessment teams, each composed of 4 people, conducted shoreline surveys, repeated for several weeks, using the Shoreline Cleanup Assessment Technique (SCAT): near to the spill location, the sand and rocks were found to be contaminated with deposits, of varying sizes, of a relatively fresh, fluid oil.

Clean-up operations included the pumping of pockets of fluid crude oil (contained by booms or trapped in dips in the ground), using vacuum trucks, in some cases together with skimmers, and manual collection/scraping of deposits left along the high tide mark, using lightweight tools (shovels, rakes, etc.) or sorbents.



Manually collecting various forms of crude oil deposits (tarballs, patches, etc.) on substrates close to the spill (near Refugio State Beach), 2 days (left), 3 days (centre) and 4 days (right) post-spill (source: USCG)


Left: Evacuating lightly oiled sand in sacks (Refugio State Beach, 23rd May); Above: scraping splashes off rocks (Source: USCG)

During the first few days following the spill, oil came ashore on remote beaches in a southward direction (as far as the county of Ventura, a few dozen kilometres away), in fragmented, weathered form (tarballs), sporadically due to the distance from the spill location.

In this respect, we note that very early on various authorities and local scientists suggested the possibility of confusion with oil from natural seeps, a known phenomenon in the region, with various identified sites[10]. Oil fingerprinting was carried out from June by the Office of Oil Spill Prevention and Response (OSPR) Petroleum Chemistry Laboratory for the state of California. Pending the results and conclusions, the operator nevertheless sent teams out to recover the tarballs on the affected sites.

By about a month after the incident, the SCAT teams had investigated a total of around 150 km of shoreline (mainly sandy beaches, with a few rocks and man-made structures), just over 60 km of which was considered to be affected to varying degrees. The majority of the operational sectors have now been cleaned, i.e. they meet the endpoint criteria set out in the SCAT technical recommendations[11]. By early June, the following quantities had been recovered: 55 m^3 of oily water mixture, around 390 m^3 of oiled vegetation, over 400 m^3 of oiled sand and nearly 2,950 m^3 of oiled soil.

[10] Responsible for the release of around 10 m^3 per day.

[11] On sandy beaches: total cover (tarballs, patties, etc.) of less than 1% of the surface area within the stretch surveyed. On rocks, stones and pebbles: less than 10% coverage within the stretch surveyed.

Final clean-up operations continued to be conducted at certain sites after June and the authorities informed the public that tarballs may continue to be observed due to natural seeps. A control and sampling programme for the cleaned sites was set up to detect any new oilings and to determine whether they were linked to the Line 901 leak[12].

On 22nd January 2016 it was announced that the endpoint criteria had been reached for all the affected sites. A surveillance phase was then organised, with the analysis of any new oilings (the final analysis was scheduled for May 2016, 1 year after the spill). So far, the results of fingerprinting on the tarballs collected from over 20 sites in December 2015 and January 2016 (and analysed independently by the U.S. Coast Guard, the Department of Fish and Wildlife and the operator) have indicated no link with the incident.

11/6: Final clean-up of stones (Source: City of Goleta)

The assessment of environmental impacts, initiated during the first few days following the spill (through surveys by half a dozen teams of 4 people), resulted in the collection of birds and mammals. Oiled live specimens as well as both oiled and unoiled dead specimens were collected until early June, with a reported total at the time of writing of 194 birds (58 live and 136 dead) and 110 mammals (43 live and 67 dead). The live animals were taken to care facilities, while autopsies were carried out on dead animals to determine whether the spill was the cause of death. No information on the results of these efforts has been found (rehabilitation success, death rate due to spill).

Finally, we note that the authorities had to rapidly handle the immediate influx of offers of support from volunteers keen to actively contribute to clean-up operations. A few spontaneous initiatives by local residents who set out to collect the fresh crude oil armed with buckets and without any specialised equipment therefore had to be dealt with in the immediate aftermath of the spill.

The day after the spill, around 130 volunteers belonging to well known organisations (California Conservation Corps, California Department of Fish and Wildlife via its Natural Resource Volunteer Program, Oiled Wildlife Care Network) were therefore involved in the shoreline response. To manage the numerous expressions of interest from the general public, candidates were asked to apply via a specific website. Up to 300 volunteers (minimum age limit of 18 years), duly trained, equipped and supervised, were therefore involved in the response in early June, half of whom were assigned to manual clean-up.

For further information:
http://www.refugioresponse.com/go/doc/7258/2522638/
http://www.plainsupdate.com/go/doc/7258/2522638/

Diesel spill caused by tank accidentally shifting (*Thor's Hammer*, Kenai Peninsula, Alaska)

On 23rd May 2015, near Seldovia on the Kenai Peninsula (Gulf of Alaska, US), a breach in a tank (with a capacity of approximately 35 m^3) located on the deck of the landing craft *Thor's Hammer* caused a spill of between 20 and 25 m^3 of diesel into the coastal waters. The incident was the result of the tank shifting and become punctured due to adverse sea and weather conditions (2.50 m waves, force 8 winds).

The response was coordinated by a Unified Command comprising federal (U.S. Coast Guard, U.S. Department of the Interior), state (Department of Environmental Conservation) and local (City of Seldovia) agencies as well as the responsible party. As is often the case with this type of light product, with low persistence, mechanical recovery was not appropriate and the priority was to reduce the risk of the spill escalating, by pumping out the diesel remaining in the third-full punctured tank.

Oil spill with high evaporation (*Kirby Inland Marine Barge*, Houston Ship Channel)

On 10th June 2015, the *Kirby Inland Marine Barge 28020*, loaded with 4,760 m^3 of naphtha, was involved in an allision in the Houston Ship Channel (Texas), damaging one of its starboard tanks,

[12] In mid-July, out of 44 tarballs sampled from various sites during a sampling programme, 1 matched the oil from the pipeline (Las Varas beach, Santa Barbara, where a clean-up team was consequently deployed).

with a capacity of 800 m^3.

According to the U.S. Coast Guard, which took charge of coordinating the response (alongside the other relevant agencies: Texas General Land Office, National Oceanic and Atmospheric Administration -NOAA, etc.), 87 m^3 of naphtha was released into the water. The results of modelling run by NOAA suggested that the product would evaporate in 3 hours, rendering any potential attempts to contain and recover it futile. As is generally the case for spills of products with high evaporation rates, we note that the emergency response mainly focused on ensuring the safety of local residents (evacuating personnel from industrial sites within the vicinity of the spill) and the main impact was on shipping traffic (a 2 km stretch of channel closed for just over 2 hours).

• Past spills

***Rena* spill: successful bird rehabilitation**

An analysis of the success of rehabilitation operations for birds oiled by the incident involving the container ship *Rena*, in October 2011 in New Zealand (see LTML n°34), was recently published by a team from the Institute of Veterinary, Animal and Biomedical Sciences at Massey University. During the incident management phase, over 383 little blue penguins (*Eudyptula minor*) were captured, cleaned, rehabilitated and released into the environment.

In 2014, the results[13] of a 2-year monitoring programme had already shown the similarity in survival rates in the natural environment for two groups of penguins: oiled/rehabilitated and non-oiled/non-rehabilitated. Furthermore, while a slight decrease in productivity was detected in the first year following the incident among rehabilitated individuals, this reduction was within the range of natural variations reported for various penguin populations in Australasia.

A new study, published in 2015, offered a comparison (again between groups of rehabilitated individuals and groups of non-oiled individuals) of the feeding behaviour (number, duration, depth and shapes of dives) and diet (stable isotope analysis of feathers) of little blue penguins. This original approach confirmed the results of the 2014 study, in particular highlighting the fact that there was no significant difference in these parameters for the 2 groups of penguins. The authors concluded that the rehabilitation measures taken for wildlife in general had been effective, thus justifying their implementation.

Despite the merits of these results, we note that the overall success of rescue operations on penguins (reported for instance during the *Treasure* spill in South Africa in 2000, the *Oliva* spill in Tristan da Cunha in 2011, and now the *Rena*) cannot necessarily be extrapolated to all bird species; other studies have shown that reproduction or survival rates can vary greatly – and be particularly low – according to the seabird species.

For further information:

Chilvers B.L., Morgan K.M., Finlayson G., Sievwright K.A., 2015. Diving behaviour of wildlife impacted by an oil spill: A clean-up and rehabilitation success? *Marine Pollution Bulletin*, Vol. 100 (1), 128–133. doi:10.1016/j.marpolbul.2015.09.019

• Response preparedness

EMSA: Dispersion capacity in the Mediterranean and new chartering contracts

The European Maritime Safety Agency (EMSA) has expanded its response capacity in the Mediterranean with the acquisition, in 2015, of a stock of 200 tonnes of Radiagreen OSD (third generation type III, i.e. neat concentrated, dispersant) produced in Cyprus. Furthermore, EMSA fitted the oil tanker *Alexandria* (operated by Patronav, based in Limassol) with a *Jason twin boom spray system*, manufactured in Norway[14]) each comprising 6 spray nozzles, supported by 2 articulated arms, as well as dispersant tanks with a capacity of 53 m^3.

[13] Presented in a thesis completed at Massey University in 2014 (Sievwright, 2014. Post-release survival and productivity of oiled little blue penguins *Eudyptula minor* rehabilitated after the 2011 *C/V Rena* oil spill. Master of Science in Conservation Biology, Massey University, Palmerston North, New Zealand)

[14] And developed in collaboration with SINTEF.

The *Alexandria* has a storage capacity of 7,460 m^3 and this new system comes in addition to the containment and recovery equipment already onboard the tanker: Lamor LSS15 sweeping arms (with brush skimmer), two 250 m sections of Lamor Oceanmaster 2200 offshore boom, a Lamor LWS 1300 weir/brush skimmer and a Noren Normar 250TI weir skimmer.

Starboard spraying arm of the Alexandria (Source: EMSA)

Furthermore, the EMSA fleet was reinforced with the entry into force of new chartering contracts in mid-2015, following the tender issued in January 2014 for 3 regions: the Atlantic (a supply vessel based in Galicia), the Black Sea (a bunker vessel based in Romania), Channel/North Sea (two dredgers based in Ostend, Belgium.

Finally, in December 2015, EMSA announced that it had contracted 2 additional vessels, to enter into operation in mid-2016 (after having fitted the necessary equipment and trained the crews): the chemical tanker *Mencey* (based in Tenerife for the Canaries/Madeira region) and the bunker vessel Norden (based in Gothenburg for the Baltic region).

For further information:
http://www.emsa.europa.eu/oil-recovery-vessels/opr-documents/contractor-info-sheets/download/3968/663/23.html
http://www.emsa.europa.eu/oil-recovery-vessels.html

Response procedures and equipment: review of ASTM standards and potential developments

As part of its Oil Spill Response Research Program (OSRR), the Bureau of Safety and Environmental Enforcement (BSEE) recently contracted SL Ross Environmental Research Ltd to review the current ASTM[15] standards for oil spill response equipment. The BSEE aims to ensure that the current standards meet its needs as part of (i) its role as regulator of offshore oil activities (e.g. requirements in terms of equipment specifications, operational procedures, etc. in contingency plans for offshore operators) and (ii) current or future developments in this respect with a particular focus on the Arctic issue.

The interesting report resulting from this work, released in 2015, contains a certain number of recommendations in terms of additional standards (e.g. modification to extend their application to cold climates) or even the development of new standards, to provide a basis for discussions which may then be put to the relevant ASTM committee[16].

The suggested developments proposed and roughly outlined here focus on the following themes:

- chemical treatment of spills, in particular the development of **application procedures for herding agents** (in particular for in situ burning, a strategy attracting particular interest for use in ice conditions in recent years)
- containment and recovery, involving
    - the creation of **inspection and maintenance protocols for containment and recovery equipment** (booms, skimmers, etc.)
    - the development of a specific standard for the assessment of **skimmer performances in ice conditions** in a controlled environment (according to the authors there are too many unique issues to modify the existing standard F631 to include such environments)
    - modification of the existing standard (F1780) on the **estimation of oil spill recovery system effectiveness** (i.e. the chain of equipment required) – despite difficulties in reaching a consensus having been previously encountered by the ASTM Subcommittee
- surveillance to support on-water operations, with
    - the development of an **overall guide on the choice of observation technologies and methods to support on-water operations**, taking into account the specificities, benefits and limitations of all the existing options (satellite,

[15] American Society for Testing and Materials
[16] in this case the F20 committee on Hazardous Substances and Oil Spill Response.

plane/helicopter, aerostat, onboard capabilities, etc.)

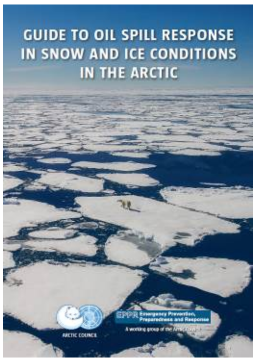
- the modification of the **Standard Guide for Selection of Airborne Remote Sensing Systems for Detection and Monitoring of Oil on Water** (F2327), in particular by integrating the real performances i.e. based on scientific evidence (rather than manufacturers' claims) of the available equipment.

Finally, a proposal is put forward for the development of an overall guide to support decision-making (for selecting, mobilising and implementing equipment) in the event of a large-scale incident (in which the simultaneous implementation of various response strategies – mechanical recovery, dispersion, burning, etc. – may prove necessary). The aim is to provide a review presenting the principles, expectations and limitations of the applicable strategies, while referring the decision-maker to all the relevant existing standards and guides.

For further information:
http://www.bsee.gov/uploadedFiles/BSEE/Technology_and_Research/Oil_Spill_Response_Research/Reports/1000-1099/1024AA.pdf

Arctic Council: Guide to Oil Spill Response in Snow and Ice Conditions in the Arctic

In 2015, the Arctic Council's Emergency Prevention, Preparedness & Response (EPPR) Working Group published a guide entitled "Guide to Oil Spill Response in Snow and Ice Conditions in the Arctic".



Drafted by Owens Coastal Consultants Ltd. and DF Dickins Associates LLC, this document is divided into 2 parts: the first focuses on on planning and preparation and the second on response and implementation. The guide is exclusively devoted to winter conditions (ice and snow cover).

The specificities/issues relating to Arctic environments, and their impact on the principles presiding over the planning and implementation of response operations, are outlined in detail, for instance from geographical (remoteness, vast areas, etc.) and geomorphological points of view, as well as in terms of the behaviour and fate of the pollutant (containment by ice, trapping in snow for various lengths of time, etc.).

Although this may not be a guide in the strictest sense of the word, this document presents an extensive review (including the results of research projects and feedback) of response strategies and equipment, for use at sea (including detection, recovery, dispersion and oil-mineral aggregates, and burning) and on the shoreline (from shoreline assessment to technical recommendations for clean-up according to the geomorphological environment).

This report thus provides a vast quantity of recent scientific and technical information relating to the Arctic context, useful in the development of contingency plans as well as in decision-making in order ultimately to optimise the balance between the efficiency of strategic choices and the environmental impact.

For further information:
https://oaarchive.arctic-council.org/bitstream/handle/11374/403/ACMMCA09_Iqaluit_2015_EPPR_Guide_to_Oil_Spill_Response_Report.pdf?sequence=1&isAllowed=y
http://arctic-council.org/eppr/

• Recovery

Recovery in strong current: trials with oil release at sea, Oil-on-Water 2015

In 2015, the Norwegian Clean Seas Association for Operating Companies (NOFO) released a report on its annual Oil-on-Water exercise, organised in cooperation with the Norwegian authorities (the Norwegian Coastal Administration, the Norwegian Coast Guard and the Norwegian Society for Sea Rescue –*Redningsselskapet*), which is aimed at verifying the performances of spill response equipment. The exercise, which was held in the Frigg oil field (North Sea), included new assessments of various newly developed, modified or marketed recovery systems designed to operate in strong current.

We note the deployment of the MOSS Sweeper 50 (see LTML n°36), DESMI Speed-Sweep (see below), Current Buster 6 (see LTML n°37) and Oil Trawler (see LTML n°40). This equipment was tested on releases, authorised by the Norwegian administration, of 20 to 45 m^3 of oil[17] (mixture of crude oil and IFO 380). Below is a brief summary of some of the key points:

- A deployment system for the MOSS Sweeper (*Egersund*) was implemented and showed: a satisfactory deployment time and safety level for personnel; the correct configuration of the deflectors on the curtain booms in a V-formation (positioned using a boom vane); the recovery and continuous transfer of the equivalent of 96% of the 45 m^3 of emulsion released in front of the *Stril Luna*. This performance was a considerable improvement from the previous exercise (2014), during which problems were identified, less in relation to the concentration and containment of the oil and more in terms of its transfer to storage capacities.

Deploying the MOSS Sweeper 50 from the Stril Luna *(Source: NOFO)*

- The exercise also confirmed the ability of the DESMI Speed-Sweep (developed based on the HISORS prototype), through the addition of 2 screens compatible with conventional booms, to operate at towing speeds of up to 2 knots without affecting oil containment at the apex of the system.
- Finally, the Current Buster 6 (NOFI) and Oiltrawl NO-T-1000-S (Norlense), which both have their own separation system downstream of the sweeping arms, were tested to determine the efficiency of the continuous transfer of the oil recovered to the vessel's tanks, using integrated pumping systems, with a relative current speed of 2.5 knots. Approximately 20 m^3 of oil emulsion was released in front of these systems. The target recovery rate of 70% was achieved by the Current Buster, while the results for the Oiltrawl were slightly below this target in the trial conditions (for reasons which are not detailed in the report).

For further information:
http://www.nofo.no/en/About/Oil-on-Water-2015/

"Strong current" equipment for conventional booms: the DESMI Speed Sweep series

As part of the Oil Spill Response 2010 research programme[18] funded by the Norwegian Clean Seas Association for Operating Companies (NOFO), the firm DESMI developed the HISORS (High Speed Oil Recovery System) concept, which consisted in adding several rows of nets to conventional booms, in order to interrupt the speed of the current as its flows towards the apex of the system. This system is designed to operate at high towing speeds and to allow high oil encounter rates, without however compromising the containment performance.

Tested and improved during successive NOFO Oil-on-Water exercises (see above), the concept marketed in the Speed Sweep range now exists in various sizes known, in ascending order, as Speed Sweep 1500, 2000, 2200 and finally 3200 (or Hi-Seas Speed Sweep).

These models are all composed of a series of 9 buoyancy chambers (each 3 m long), delineating a containment area across which 3 successive nets are positioned (Kevlar, coated with polyurethane), fitted with floats. Each screen reduces the laminar surface flow from the opening to the apex.

Whatever its dimensions, the Speed Sweep is designed to be connected to sections of Ro-Boom 1300 (deflated height of 1.30 m), therefore requiring identical connectors.

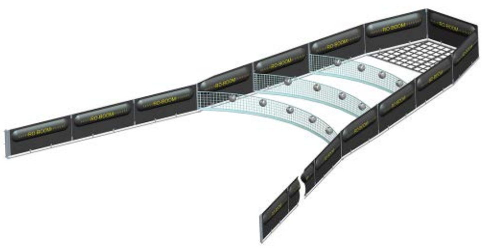
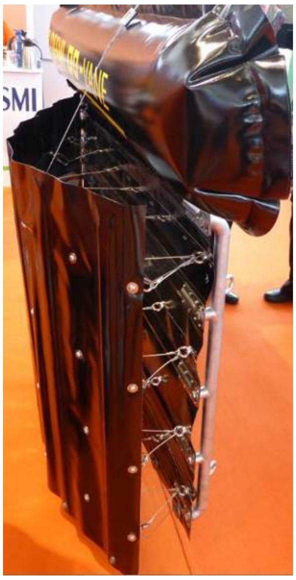


Diagram of the Speed Sweep (Source: DESMI)

The skirt height increases gradually towards the apex where they system has a total height (deflated) of 1.50 m (Speed Sweep 1500), 2 m (Speed Sweep 2000), etc. up to a maximum of 3.20 m. According to the manufacturer, these models are suitable for conditions from 1.50 to 2.5-3 m waves and effectively contain oil in relative current speeds of up to 3 knots.

17 122 m^3 in total
18 See LTML n°36



The system can be towed by 2 boats operating in a pair trawling configuration, or by a single boat with a jib arm or paravane.

In this respect, the Danish firm launched its own paravane in 2015. Originally marketed as the Ro-Vane, it is now christened the Ro-Kite, due to how it operates: the device is powered by a structure in the form of a vertical wing, similar to a kite. With a draught of 2.20 m, the "kite" part is supported by vertical steel bars and is buoyed by a 3 m-long inflatable chamber.

The Ro-Kite 1500 can be dismantled/folded and is designed to be used together with the Speed Sweep 1500, or more generally in the conditions for which this boom is intended (coastal waters).

Left: The prototype of the DESMI Ro-Vane (Source: Cedre)

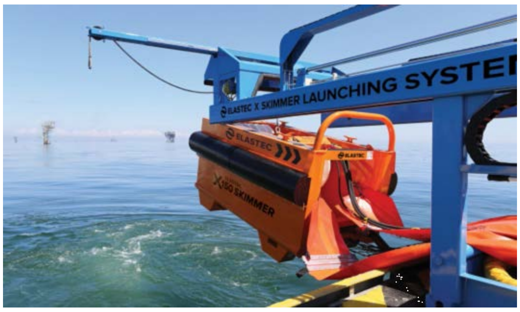
For further information:
http://www.desmi.com/advanced-sweep-systems/speed-sweep.aspx
http://www.desmi.com/UserFiles/file/oil%20spill%20response/SpeedSweepSystems.pdf

Integrated recovery system: X150 Skimmer Launching System

The US firm Elastic developed the X150 Skimmer Launching System, based on its X150 grooved disc oil skimmer (see LTML n°35). This turnkey system is an improved version of the prototype which won first place in the Wendy Schmidt Oil Cleanup X Challenge in the wake of the Deepwater Horizon crisis. This comprehensive system comprises a containment system, a paravane (BoomVane) as well as a launch and retrieval device for the whole of the containment and recovery module.

The integrated deployment system is remote controlled and includes the launcher, the X150 skimmer, boom and reel, a paravane and a power pack. The hydraulic and discharge hoses are built into the boom. All the components are stored within a robust steel frame which fits into a 20-foot container for storage and shipping. The full system (excluding container) weighs just over 7 tonnes

The X150 Skimmer Launching System being crane-lifted onto a vessel's deck (Source: Elastec)



As the name suggests, the skimmer has an oil recovery capacity of 150 m^3/h, in calm waters, and 125 m^3/h in wave conditions. It has an oil recovery efficiency of 90% at speeds of less than 3 knots. It comprises 2 rows of 5 grooved discs and weighs around 600 kg.

Left: Launching the skimmer using the launching system (Source: Elastec)

The 30 m-long boom has a draught of 25 cm and a freeboard of 46 cm. Integrated netting assists in retaining the sweep configuration and the single-point inflation boom is inflated by an air blower incorporated in the reel. Foam panels act as reserve buoyancy in case of puncture.

The system's ease of deployment and the behaviour of the containment and recovery module were verified during trials recently carried out near Port Fourchon (Louisiana), in the Gulf of Mexico.

View of the system, deployed from a non-specialised vessel (Source: Elastec)

For further information:
http://elastec.com/oilspill/xskimmer/

http://www.elastecdealer.com/wp-content/uploads/oil-spill-equipment/skimmers/X150-Skimmer-Launching-System-Description-BSK-078.pdf

High sea recovery system: from the 1970s to the ORS-1000 (Ocean Systems LLC)

The US service provider and manufacturer Ocean Systems LLC has recently launched a large-scale recovery system developed for high sea response, offering high recovery rates. New to the market, this system is the upshot of a comparatively old skimmer and boom system project developed through a U.S. Coast Guard skimming barrier project funded by the federal administration, based on the requirements identified following the Unocal platform A incident in the Santa Barbara Canal (1969, US)[19].

Renamed ORS-1000, this system is composed of two 750 m sweeping arms towed in a pair trawling configuration by workboats (giving a 750 m swath width). At the apex of the system, 2 rows of weirs delineate a basin where the oil is concentrated. This basin features slots in its base to allow water to be sucked out. Oil suction hoses are connected to the rear of the basin to transfer the oil to storage capacities aboard a third vessel which completes the system.

The boom itself has a draught and freeboard of 60 cm and is flat, a shape considered more efficient that a cylindrical chamber for funnelling the oil to the apex. Its buoyancy and seakeeping performance (articulation and stability) are provided by a series of inflatable cylindrical floats (L=1.20 m; Ø=40 cm), attached perpendicularly to the outside edge of the boom (i.e. parallel to the water surface) and fitted with counterweights.

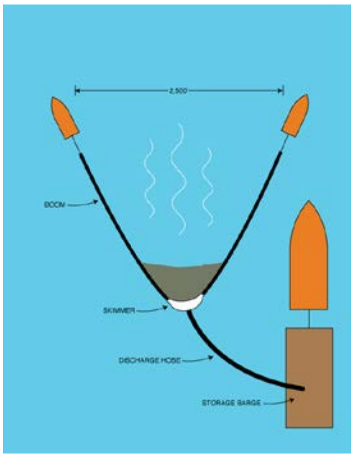
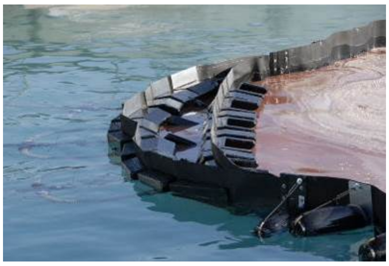


Diagram showing the deployment of the ORS-1000 (Source: Ocean Systems LLC*)*

An external tension line runs the whole length of the boom.

The system's nameplate recovery rate is almost 230 m^3/hour (1,000 gallons/minute), with an oil recovery efficiency of 90% (up to a maximum of sea state 3).



Left: The floats positioned on the outside of the ORS-1000's deflection boom arms (Source: Cedre); Right: The 2 rows of weirs concentrating the oil at the apex of the system (Source: Ocean Systems LLC)

Tests on a prototype at OHMSETT (Source: Ocean Systems LLC*)*

These estimations are based on the results of series of tests carried out at OHMSETT's testing facilities on a one-third scale prototype. The conditions simulated a current speed of 1.6 knots and a wave height of 1.25 m at full scale.

Originally, prototypes of various dimensions were produced (for use as a permanent offshore boom and for dynamic trawling for use inshore and in harbours), first tested at OHMSETT in 1975 (Chang, 1975; Blockwick and Smith, 1975) then at sea in 1976, showing performances considered promising at the time (Lichte, 1979).

The use of this prototype as a single-vessel skimming system (SVS), using an outrigger, was the focus of technical developments in the 1980s (McManus, 1987).

Finally, sensors and dynamic positioning systems have been added to the vessels to optimise the encounter rate with the largest slicks. Furthermore, as the water intake during the final collection phase (i.e. during pumping) is linked to the thickness of the oil in the apex, the manufacturer has

[19] As a reminder, this incident involved a blow-out followed by the release of approximately 15,000 m^3 of crude oil, polluting the coasts of Southern California. The incident is currently considered as the third largest in US waters (surpassed by the *Exxon Valdez* in 1989, then *Deepwater Horizon* in 2010).

apparently developed an automated system to start the pump as soon as the storage basin is full.

For further information:
http://www.oceansystemsllc.net/index.html

Blockwick et Smith, 1975. *Redesign, Fabrication and Test of a 1000-GPM High Seas Oil Recovery System and Design only of a 500-GPM High Seas Oil Recovery*. USCG-D-182-75 Final Report. National Technical Information Service; no. CG-D-182-75.
Chang W.J., 1975. *Tests of Coast Guard developed high seas oil recovery systems at EPA OHMSETT*. Report - U.S. Coast Guard, Office of Research and Development; no. CG-D-101-75.
Lichte, H. W. 1979. *Skimming barrier performance evaluation: Offshore version and harbor version*. In: Proceedings of the 1979 Oil Spill Conference; 489-492.
McManus, K.R., 1987. *Conversion of a U.S. Coast Guard skimming barrier into a single-vessel skimming system*. In: Proceedings of the 1987 Oil Spill Conference; 111-113.

Koseq equipment for vessels of opportunity: Compact 502 and Victory Oil Sweeper

The Dutch firm Koseq offers a compact, containerised version of its sweeping arms: Koseq Compact 502.

Unlike previous models, intended to be mounted on spill response vessels, this system is designed for small non-specialised boats, commonly referred to as vessels of opportunity (VOOs).

It is based on the same sweeping arm principle but in smaller dimensions with a 5 m-long arm, with a weir skimmer at the base, coupled with a submersible pump (Marflex MSP 100) with a nameplate capacity of 150 m^3/hour. The skimmer can be an oleophilic brush (like the larger models), disc or drum skimmer.

Deploying the Koseq Compact 502 (Source: Koseq)

With its auxiliary equipment, including an independent hydraulic power pack (driven by a diesel engine), a lifting device (telescopic crane) and the control box, the whole system (weighing around 10 tonnes) is stored in a standard 20-foot container which can be easily transported by road, rail, etc.

The firm also sells another model of recovery arm, the Victory Oil Sweeper, developed specifically for vessels of opportunity which do not have enough deck space to store equipment.

The Victory Oil Sweeper operated by a push-tug (Source: Koseq)

This system is composed of 2 sweeping arms positioned in a V shape designed to be pushed by (or attached alongside) a workboat. By adjusting the angle between these arms, the swath width can be adapted according to the speed of travel.

At the apex of the system, the collection chamber is equipped with 2 Marflex MSP 150 pumps (with a nameplate capacity of 2x360 m^3/hour), bearing in mind that the weir can be replaced by oleophilic modules (belt or brushes), or even a conveyor belt for collecting floating debris (for cleaning harbours).

For further information:
http://www.koseq.com/
http://www.vidicon.info/projecten/koseq.com//site/media/Brochure%20Compact%20502.pdf
http://www.vidicon.info/projecten/koseq.com//site/media/Brochure%20VOS.pdf

Expansion of the BoomVane range

In 2015, the US firm Elastec added the 1.5 m BoomVane to its range of paravanes (technology developed by the Swedish firm ORC). With a 1.6 m draught, it is a halfway house between the 1 m and 2 m models (previously the Standard and Ocean models), designed respectively for use in shallow waters (e.g. estuaries, rivers, harbours) and in the open sea. The intermediate sized 1.5 m model is designed for inshore use, and is claimed to be able to deploy 100 to 150 m of boom (according to the boom's dimensions, i.e. freeboard and skirt length).

Based on tests carried out at sea in 2015, the company announced that this model had been used to deploy 160 m of offshore boom (1 m draught) to achieve a swath width of over 20 m (in unspecified current conditions).

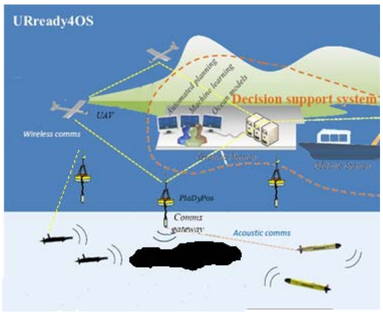
For further information:
http://www.elastec.com/oilspill/containmentboom/boomvane/1.5mstandard/index.php

• In situ oil detection/monitoring

European research project on underwater oil detection: *URready4OS*

The project entitled Underwater Robotics ready for Oil Spills (URready4OS), co-financed by DG Humanitarian Aid and Civil Protection (DG ECHO), has just come to a close (1st January 2014-1st January 2016). It involved university teams from 4 Mediterranean countries (Cartagena, Spain; Porto, Portugal; Zagreb, Croatia; and Nicosia, Cyprus). URready4OS aimed to identify, for European Civil Protection, a fleet of autonomous underwater vehicles (AUVs) equipped with sensors for oil detection in the water column, and unmanned aerial vehicles (UAVs) and unmanned surface vehicles (USVs) for real-time data transmission. The robotic system uses new cooperative multivehicle robotic technologies, in order to self-organise the devices (positioning, interactions) and therefore enable early detection of subsea spills (blow-outs, wrecks, etc.) which cannot be detected by aircraft or satellite.

The project's ultimate aim was to produce a decision support system for response operations which could be easily operated and adapted. It comprised the following phases: assessment and selection of sensors readily available on the market (and relatively low cost); definition of the tasks to be carried out by the robotic vehicles; development of the algorithms required for their coordination/cooperation, as well as of interfaces for data processing and retrieval.



The system's overall architecture and the results of preliminary experimentation at sea were presented at Interspill 2015 (see link below).

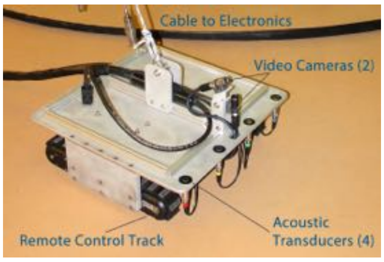
Final tests were run in the Mediterranean (near Cartagena) in late June 2015, coordinated by the *Universidad Politecnica de Cartegena* with support from SASEMAR. These tests included the deployment and assessment of the performance of a set of 5 types of autonomous vehicles (three models of AUV – from the Universities of Porto, Zagreb and Cartagena; two X8 UAVs altered by the University of Porto, and one USV – PlaDyPos – developed by the University of Zagreb), fitted out for this demonstration with Turner Cyclops-7 fluorometers (rhodamine was used to simulate plumes of pollutant) and with the Neptus command and coordination system, specially developed by the University of Porto (Underwater Systems and Technology Laboratory, LSTS).

For further information:
http://www.upct.es/urready4os/?lang=en
http://www.upct.es/urready4os/wp-content/uploads/2014/06/Brochure_URready4OS1.pdf
Gilabert J., Sousa J., Vukić Z., Georgiou G., López-Castejón F., Guerrero A., Calado **P., Mišković N., Vasilijević A., Hayes D., &** Martínez D., 2015. *Underwater Robotics ready for Oil Spills*. Interspill 2015 Conference Proceedings.

Prototype for acoustic measurement of slick thickness

As part of its Oil Spill Response Research (OSRR) programme, the Bureau of Safety and Environmental Enforcement (BSEE) funded the development of a prototype composed of a remotely operated vehicle (ROV) fitted with inexpensive acoustic sensors, capable of measuring the thickness of an oil slick (from below) within the range from 500 micrometers to over 3 centimetres.

This project aims to fill the gaps in identifying the thickest parts of a spill both offshore (following incidents involving slicks stretching over vast areas, like the *Deepwater Horizon* spill) and in the expanding context of oil exploration in the Arctic, where climate conditions hinder oil observation (oil trapped in/under ice, etc.).



Prototype of the Acoustic Slick Thickness ROV (Source: VIMS)

This project was carried out by the Applied Research Associates (ARA) and the Virginia Institute of Marine Science (VIMS).

These partners designed a robotic ROV intended to be deployed below floating slicks, under the ice, etc. It is fitted with 2 acoustic transducers (as well as 2 video cameras and one thermometer) to: (i) detect, at high resolution, discontinuities in density between the layers of oil and water, oil and air and oil and ice, and (ii) georeference the acoustic data collected, in order to map the distribution of oil thicknesses.

The device was tested in the OHMSETT tanks where it was deployed below floating slicks, along railings. Its performance was assessed for various oils and refined products. VIMS's own facilities were used to test the vehicle under blocks of ice. ARA aimed for the device to be capable of collecting data over a stretch of up to 10 metres in 1 minute, bearing in mind that it takes 2 to 5 minutes to process the data for oil thickness mapping.

ROV assessment trials in the VIMS pool (Seawater Research Lab) (Source: VIMS)

The prototype, delivered to OHMSETT to support future research in this field, could potentially be used to estimate the quantity of oil released by a subsea source (requiring adaptations to allow lateral, rather than simply upward, emission of the acoustic signals). The use of these acoustic methods for determining droplet size was assessed by VIMS as part of a previous BSEE project (2014) which aimed to develop tools to measure subsea chemical dispersant efficacy.

For further information:

Panetta, P., McElhone, D., Carr, L., & Winfield, K. (2015). Acoustic Tool to Measure Oil Slick Thickness at Ohmsett. Bureau of Safety and Environmental Enforcement. Sterling, VA. Final Report for U.S. Department of the Interior & Bureau of Safety and Environmental Enforcement (BSEE), Herndon, VA. Project #1028. 55 pp.

• Dispersion

Chemical dispersant regulations in the US: amendments proposed in 2015

In 2015, the US EPA proposed to amend the requirements of Subpart J of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) relating to the use of dispersants, in light of the lessons learned from the *Deepwater Horizon* spill. In broad terms, these amendments aim to ensure that approved products meet efficiency and toxicity criteria, and include the provision of an increased amount of product information (safety, toxicity, use, etc.) from manufacturers.

The proposed amendments include: revised efficacy[20] and toxicity[21] test protocols; the mandatory disclosure of the list of components of a dispersant submitted for approval (but not their concentrations); the prohibition of certain components (nonylphenol and nonylphenol ethoxylates).

Furthermore, the inclusion of chemical dispersants in response plans (and how they are used) could be required to be retested every 5 years, or following a major spill providing new information.

Proposals were also put forward on the environmental monitoring of dispersants, again based on the *Deepwater Horizon* experience, including a possible water sampling requirement in the case of subsea dispersion of releases exceeding 380 m^3/day (or surface spraying for over 4 days), including in areas which are not immediately affected (i.e. in the short term) by the spill.

For further information:
https://www.epa.gov/emergency-response/revisions-national-oil-and-hazardous-substances-pollution-contingency-plan

New API guide: surface dispersion preparedness and operations

The American Petroleum Institute (API) has recently published a report entitled "Aerial and Vessel

[20] E.g. Replacement of the Swirling Flask Test with the Baffled Flask Test; replacement of current test oils (South Louisiana Crude and Prudhoe Bay Crude) with other lighter oils (Alaska North Slope and IFO–120); new test temperature(s) (5 and 25°C, rather than the current temperature of 23°C).

[21] No. 2 fuel oil (similar to diesel) replaced with Alaska North Slope and IFO–120; possible introduction of a test on echinoderms (development anomalies) to detect any sublethal effects.

Dispersant Preparedness and Operations Guide".

This document, which concerns the treatment of surface slicks, is divided into 2 parts providing advice and examples relating to:

- preparedness, including guidance on the response organisation, personnel training, exercises and other preparedness activities in order to determine the availability of the resources (expertise, logistics, etc.) required to implement spraying operations, and to achieve a suitable level of preparedness.
- operations, addressing the need to define objectives (and to verify their achievement) and outlining a certain number of operational procedures. This section presents proposed actions (e.g. forms to be completed, etc.) to obtain rapid approval from the authorities (applicable to the US context) and documents (flow charts, forms, etc.) to ensure efficient operation management (e.g. coordination, flight plan organisation) and operational data management (reporting, archiving, etc.).

This guide is designed to support the development of contingency plans relating to chemical dispersion, for both private and public bodies. Although it is clearly based on a US regulatory and administrative context, but also US practices, experiences, etc., it contains many elements (operational procedures, logistical constraints, decision-making, etc.) which provide a common basis for international good practice guidance and remains a potentially interesting source of information in this respect.

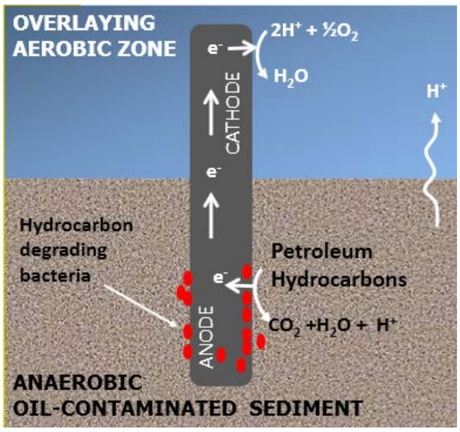
For further information:
http://www.oilspillprevention.org/~/media/oil-spill-prevention/spillprevention/r-and-d/dispersants/api-technical-report-1148-final.pdf

• Research

Kill•Spill project progress

Kill•Spill is an EU-funded research project which aims to develop new oil spill response methods and products based on biotechnological solutions. This project, launched in 2014, runs until December 2016. Among the methods already available or in their test phase, we find: biosensors developed to continuously monitor oil degradation in the environment; new dispersants and sorbents with lower toxicity levels than the most widespread products; new oil-degrading bacterial consortia for treatment based on the concept of bioaugmentation.

Among the range of techniques and products developed, we note a promising biostimulation agent based on nanoparticle technology. These nanoparticles free the nutrients they contain only upon contact with oil droplets, ensuring that the biostimulant comes into contact with the bacterial communities developing on the oil.



As part of this project, a second process, also under development, aims to accelerate the oil biodegradation process in ecosystems such as mudflats and mangroves. This technique, baptised the "Kill•Spill Snorkel", is based on a "mat" of electrodes placed within the sediment to provide these anoxic environments with an electron acceptor other than oxygen.

This method, which uses autonomous electrodes powered by solar panels, could prove interesting for treating less frequented areas affected by residual contamination.

For further information:
http://www.killspill.eu/

US research plan: the federal government's priorities for 2015-2021

The Interagency Coordinating Committee on Oil Pollution Research (ICCOPR), chaired by the U.S. Coast Guard (NOAA, BSEE, and EPA rotate assignments as the vice-chair) and commissioned with 15 members representing independent agencies, departments, and department components, is an advisory body tasked with coordinating the multiple public research activities relating to oil pollution.

The committee updated (as prescribed by OPA 90) the national Oil Pollution Research and Technology Plan (the previous version dated back to 1997), including some 150 priority research needs for the 2015-2021 period, divided between 4 classes composed of Standing Research Areas in oil spill response, assigned as follows (in descending order of priority):

- Response
  - Structural Damage Assessment and Salvage
  - At Source Control and Containment
  - Chemical and Physical Behavior Modeling
  - Oil Spill Detection and Surveillance
  - In- and On-water Containment and Recovery
  - Shore Containment and Recovery
  - Dispersants
  - In-situ Burning
  - Bioremediation
  - Alternative Countermeasures
  - Oily and Oil Waste Disposal
- Injury Assessment & Restoration
  - Environmental Impacts and Ecosystem Recovery
  - Environmental Restoration Methods and Technologies
  - Human Safety and Health
  - Sociological and Economic Impacts
- Prevention
  - Human Error Factors
  - Waterways Management
  - Vessel Design
  - Drilling
  - Rail & Truck Transportation
  - Pipeline Systems
- Preparedness
  - Pre-spill Baseline Studies
  - Response Management Systems (information management, GIS, etc.)

The details of the 150 priorities, and the considerations from which they emerged (feedback, gaps identified based on reviews, emergence of issues such as response in cold environments, unconventional oils, etc.), were rendered public via the report published in September 2015.

For further information:
http://www.uscg.mil/iccopr/files/Approved%202015%20ICCOPR%20R&T%20Plan.pdf

Subsurface oil detection: review, recommendations and investigation by service dogs

As part of a programme run by the API (American Petroleum Institute) Joint Industry Oil Spill Preparedness and Response Task Force, several complementary studies have been carried out on subsurface oil detection and delineation techniques, in particular in shoreline sediment.

In short, a review has shown that current practice relies heavily on visual observations, made in excavated pits and trenches in substrates. Such investigations are time-consuming, and, if not enough time is available, this can generate data which is too sparse too provide an accurate survey of the buried pollution. A review of techniques which currently exist or are under development in this field was therefore carried out and recommendations made, including the potential use of service dogs (olfactory sensitivity), in light of the work conducted by SINTEF in 2008 in Svalbard[22] as part of the Oil-in-Ice JIP[23]).

In this context, field investigations into the feasibility of and possible improvements to this technique were implemented in 2015, and were outlined on a poster presented at Clean Pacific 2015 (Vancouver). Based on 2 groups of dogs trained by a dog training school, 2 types of tests were carried out, respectively involving the detection of (i) a single point source of buried oil within an area of around 0.5 hectares (5,000 m^2) and (ii) 50 samples placed in plastic tubes and positioned in

[22] Brandvik, P.J. & T. Buvik, 2009. Using Dogs to Detect Oil Hidden in Snow and Ice – Results from Field Training on Svalbard April 2008, *SINTEF Oil-in-Ice final report No. 14*, Trondheim.

[23] Joint Industry Program on oil spill contingency for Arctic and ice-covered waters, between the oil and gas industry and several research organisations, coordinated by SINTEF and aimed at assessing the contributions of various technical solutions for oil spill response in the Arctic environment.

various configurations[24], simulating discontinuous pollution scenarios, within areas of 1,250 m^2.

For each of the 7 point source tests, it took the dogs an average of 3 minutes to detect the samples, with no false positives. By the end of the 14 scattered sample tests, 20 errors (undetected samples or false positives) had been recorded, 19 of which were attributed to the experimentation procedure by the study's authors (Owens Coastal Consultants). According to the authors, the average investigation time with this technique (11 minutes for 1,250 m^2) in experimental conditions is equivalent to the time required to investigate 1 or 2 points by a conventional SCAT team.

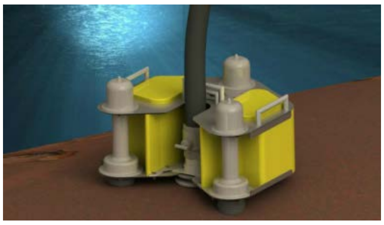
For further information:
Owens, E.H., Dubach, H.C., Castle, R.W., Bunker, P., 2015. *Field trials to locate and delineate subsurface oil on land and shorelines using detection dogs*. Proceedings Clean Pacific 2015 (poster)

• Wrecks

Oil removal from shipwrecks: the Moskito Oil Recovery System (Miko Marine)

The Norwegian firm Miko Marine has developed and is marketing a new system designed to remove liquids – oil, chemicals or other liquids – from the tanks of sunken wrecks, at risk of releasing their cargoes. This project, launched in 2012, was supported by the Norwegian Coastal Administration (NCA) through a partnership between Miko Marine and Innovation Norway (Norwegian public establishment whose role is to promote industry-led research and development initiatives).

This device is compact (65 cm x 45 cm), lightweight (70 kg, neutral buoyancy in seawater) and can be deployed by divers or by a remotely operated vehicle (ROV) according to the depth at which the wreck lies (the standard version is designed to operate at depths of up 300 m). Once it has been attached to the hull using its magnetic tripod, the device is remote controlled to drill a 7.5 cm-diameter hole in the shell plate – which may be several centimetres thick – and automatically connects up to a hose.



(Source: Miko Marine)

According to the manufacturer, the device's pump can extract the oil at the rate of 12 m^3/hour.

The Moskito is lighter – with a lower recovery rate – than the Framo ROLS system, meaning that it can be rapidly deployed. Furthermore, it can apparently be easily repositioned without having to be brought to the surface and multiple units can be used to achieve a higher extraction rate.

For further information:
http://www.mikomarine.com/wp-content/files_mf/1431095150ProductsheetMoskito4sided.pdf

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[24] 50 tubes buried at depths of up to 90 cm, containing alternately small quantities of contaminated sediment, clean sediment or no sediment.