CENTRE OF DOCUMENTATION, RESEARCH AND EXPERIMENTATION ON ACCIDENTAL WATER POLLUTION
715, Rue Alain Colas, CS 41836 - 29218 BREST CEDEX 2, FRANCE
Tel: +33 (0)2 98 33 10 10 – Fax: +33 (0)2 98 44 91 38
Email: contact@cedre.fr - Web: www.cedre.fr

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Contents

• Spills

Oiling of popular tourist beaches due to a spill at an offshore PTTGC terminal (Thailand)

On 27th July 2013 in the Gulf of Thailand, 20 km off the Map Ta Phut deep-water port and refinery (Rayong Province), over 70 tonnes of crude oil were released at sea from a hose pipe (40 cm in diameter), at a single point mooring at the offshore terminal operated by the State company PTT Global Chemical (PTTGC).

The crack in the pipe, of which the cause is unspecified[1], occurred as the cargo was being unloaded from an oil tanker.


Spraying dispersants using spray arms and fire hoses (Source: Royal Thai Navy)

At sea, the emergency response mobilised 11 vessels (unspecified types) and several aircraft, to conduct containment and mechanical recovery operations, as well as the spraying of chemical dispersants (35 to 40 m^3 of DASIC Slickgone NS according to PTTGC), implemented by 4 vessels, certain of which were fitted with spray arms (the Oil Spill Response Limited (OSRL) plane *Hercules C-130* is also said to have been mobilised).

Meanwhile, aerial surveys conducted by Royal Thai Navy helicopters reported that the slicks were drifting towards the island of Koh Samet, where crude oil began to wash up the following day.

Throughout the week following the spill, analysis of satellite images confirmed the significant reduction in slicks at sea. The response therefore focused on the shoreline pollution, which was severe (see photos) but only affected a limited stretch of coastline, in total around 600 m of the sandy beaches of Phrao Bay.

Clean-up operations were implemented by PTTGC and Royal Thai Navy personnel, with support from volunteers[2] and interministerial coordination (ministries of energy, transport, interior, and natural resources and the environment). The actions included (i) containment of floating oil in inshore waters by booms, followed by recovery by various means (pumping, collection in buckets), and (ii) selective manual recovery of stranded crude oil, using lightweight tools (shovels) and sorbents. Locally, final clean-up of hard surfaces (rocks and infrastructures) was performed by pressure washing, with certain press sources indicating the believed use of washing agents, without specifying the type and conditions of use.

According to the authorities, the shoreline clean-up operations lasted one week, following which the solid and liquid waste[3] was transferred by barge to the mainland, where it was treated by specialised facilities.

In terms of environmental impacts, we note reports from 1st August by representatives of Khao Laem Ya-Mu Ko Samet National Park, adjacent to the affected sites, of impacts on coral reefs and a complaint filed in this respect (the claimants pointed to the use of chemical dispersants at sea as the cause of this impact).

The Department of Marine and Coastal Resources decided to implement an assessment of the potential impacts on various environmental components, including coral reefs, mangroves, rare marine species and marine birdlife (the results of this assessment are unknown to us).

Furthermore, the Province's Marine and Coastal Resources agency announced the implementation of a daily monitoring programme for seawater contamination, as well as for the health quality of resources consumed from the polluted area. Sampling of mussels and fish sold on local markets is reported to have shown PAH and mercury levels in compliance with admissible values (tests on arsenic, lead and cadmium levels were also performed, the results of which do not feature in our information sources). Around 250 of the 1500 people considered as having been exposed to the pollution during clean-up (responders, local inhabitants, journalists, etc.) underwent medical follow-up (urine test) which was not reported to have revealed any specific problems according to the Thai Ministry of Public Health.

The loss in tourism revenue, due to the banning of access to sites and transfer of tourists to other

[1] Certain press articles suggest the pipe may have been hit by a ship.
[2] Around 600 soldiers and 100 volunteers and personnel from specialised companies were said to be involved.
[3] Quantity/tonnage not provided in our information sources.

destinations, was estimated at 100 million baht (€2.5M), within the context of the heavily tourism-based economy of the island of Koh Samet, according to the Tourism Council of Thailand.

In early August, in terms of fisheries, a "Rehabilitation Committee" (chaired by the Provincial Governor and gathering 20 members from government agencies and the private sector), acting as an intermediary between local fishermen and PTTGC, called for the company to pay fixed compensation of 30,000 baht (€750) per household (i.e. €25/day for 30 days from the day of the incident)[4].

This plan was considered insufficient by the representatives of the Small-Scale Fishermen's Association of Rayong, arguing that 1,000 households had been affected (directly or else indirectly due to damage to the image of seafood products), during the high fishing season.

In terms of incident management, various controversies were rapidly broadcast by the press, over the supposed transparency of the information communicated by PTTGC (in particular on the extent of the spill and its potential effects) and response actions (perceived lack of preparedness and use of excessive quantities of chemical dispersants in particular).

A year on from the spill (July 2014), following unsuccessful attempts to find amicable agreements, tour operators and hotel owners on Koh Samet took legal action against PTTGC, claiming 350 million baht (€8.2M) in compensation.

Fishermen were reported to also be considering filing a complaint against the company.

Rogue wave in a port: the *Patriot Andalan* spill (Indonesia)

On 31st July 2013, the oil tanker *Patriot Andalan* belonging to the Indonesian State-owned company Pertamina caused a spill of several thousand cubic metres of light petroleum products in the Port of Ternate (Indonesian province of North Maluku). The tanker was loaded with 7,000 m^3 of fuel (petrol and high speed diesel) and was at anchor, as its cargo was being unloaded at the PT Pertamina terminal, when a very high and sudden wave (so-called rogue or freak wave) projected it against the port infrastructures. The violence of the collision severely damaged the vessel which, after safe evacuation of the crew, rapidly sank then released the majority of the contents of its ruptured tanks (of which only 600 m^3 had been unloaded before the incident, according to Pertamina) into the water.

The oil company implemented emergency response actions, mainly focusing on containing the fuel close to the wreck using booms. According to various sources, dispersant spraying operations were also implemented, although no details are provided. Meanwhile, the wreck was inspected by divers, to identify and plug the remaining leaks, and barges were mobilised for the transfer of the fuel remaining on board. Pertamina estimated the volume released into the water at around 5,400 m^3.

Diesel spill from a transfer pipe (Petron Corp., Philippines)

On 8th August 2013, as the oil tanker *Makisig* was being unloaded, a leak from an offshore transfer pipe, connected to a loading buoy at the Petron Corp. terminal in Rosario (Cavite province, Philippines) resulted in a spill of around 500 m^3 of diesel. The incident occurred in Manila Bay, a sensitive area as it is the busiest shipping route in the Philippines and a source of livelihood for tens of thousands of fishermen.

Initially, the leak point – from the oil tanker or terminal pipes – was not clearly identified and, while oil fingerprinting confirmed the similarity with the cargo of the *Makisig*, it was not until 12th August that PCG divers confirmed that the leak was coming from the underwater pipe.

According to the Philippine Coast Guard (PCG), the diesel spread over a 20 km stretch of coastal waters, from the first few hours following the spill, covering a surface area of around 300 km^2, representing an estimated 15% of Manila Bay. Nevertheless, the spread and rapid dissipation (evaporation, natural dispersion, dissolution, etc.) of this non-persistent product meant that response operations at sea (containment/recovery, chemical dispersion) were not necessary.

Coastal pollution in sensitive areas: *St Thomas de Aquinas* spill (Philippines)

On 16th August 2013, the passenger ferry *St Thomas de Aquinas* (11,405 GT) collided with the container ship *Sulpicio Express 7* around 9 km from the Philippine port of Cebu. The ferry immediately sank in waters 40 m deep, with 120 m^3 of IFO 180, around 20 m^3 of diesel and 20 m^3 of

[4] To obtain more compensation, fishermen would have to file lawsuits individually.

lubricants on board, of which an unspecified quantity began to leak. More importantly, the ferry was transporting 840 passengers, over 100 of whom were killed in the tragedy: the emergency response led by the Philippine Coast Guard focused primarily on rescuing passengers from the *St Thomas de Aquinas*.

As of the following day, the fuel drifted in the shallow coastal waters of the Cordova region, where small-scale fishing is a major activity. Oil was washed up on a coastline with various sensitive resources, including mangroves, port infrastructures and difficult access rocky areas.

At sea, response attempts by PCG were limited by adverse weather conditions (monsoon, tropical storms, etc.).

Aerial surveys reported oil leaks for 4 weeks following the incident. However these upwellings dissipated relatively quickly at the surface (spreading, evaporation, natural dispersion, etc.) and the risks for the shoreline were moderate.

Spraying dispersants by boat (spray arms) (Source: ITOPF)

The owner of the ferry contracted specialised companies (Malayan Towage & Salvage Corp, Nippon Salvage) to survey the wreck and rapidly implement plugging operations, completed by the end of August, followed by bunker tank pumping operations, conducted during September[5].

On the shoreline, initial clean-up operations were initiated by military and civil personnel, under the authority of PCG and the Province of Cebu, before ultimately being implemented by the ferry owner and his contractors, with support from the P&I club's technical expert (ITOPF) and under the supervision of PCG.

The operations lasted around two and a half months.

In terms of the mangroves, due to their environmental sensitivity, manual collection of oiled debris in accessible areas was prioritised over more aggressive response techniques.

***Left**: Low pressure rinsing of hard substrates (limestone) and effluent recovery using conditioned sorbents; **Right**: Manual recovery of accumulations of pollutant and oiled debris (source: ITOPF)*

The Department of Environment and Natural Resources (DENR) is reported to have tasked the competent Philippine agencies (Coastal Marine Management Division of the Protected Area, Wildlife and Coastal Zone Management Services, Community Environment and Natural Resources Office of Cebu City) with assessing the impacts on the oiled mangrove. According to ITOPF, the P&I Club also commissioned a study into the impacts on the mangroves in Cordova. ITOPF also reports that the identification of primary and intermediate waste storage sites and their conditions of use, in particular at the beginning of the response, together with the availability of basic equipment (conditioned sorbents, PPE, pressure washers, etc.) proved to be determining factors in the set-up of clean-up operations.

Severe pollution threats due to groundings: bulk carriers *Smart* and *Kiani Satu* (South Africa)

On 19th August, the bulk carrier *Smart* (151,000 GT; Panama flag) grounded for an unknown reason[6] on the sandy coast near to the port of Richards Bay, in South Africa, where it had just loaded 147,650 tonnes of coal bound for China. At the time of the incident, the South African Maritime Safety Authority (SAMSA) announced that there was an estimated 1,800 tonnes of fuel oil and 130 tonnes of diesel on board.

[5] According to Malayan Towage and PCG, at least a quarter of the bunker fuel was spilt at sea, i.e. at least 30 m³.

[6] Certain press sources make mention of possible engine failure, however this was not confirmed by the authorities to the best of our knowledge.

From the day of the grounding, the ship's exposure to strong ocean swell – with up to 10 metre-high waves – gave rise to fears of damage to its structure in the short term.

The central section showed signs of deformation and, less than 3 hours after the incident, the structural integrity of the ship was compromised. The National Sea Rescue Institute (NSRI) evacuated the crew of the *Smart* by helicopter before the ship began to break up. The 23 crew members were all safely rescued.

August 2013: the Smart, broken in 2 near Richards Bay (Source: NSRI)

Experts from SAMSA and from the contracted salvage company Subtech Group immediately boarded the *Smart* to perform a preliminary assessment of its condition and possible treatment options.

The bulk carrier broke in 2 during the night following the grounding. Fuel removal then became a major priority to minimise the risks of ecologically sensitive areas being oiled (in particular the marine sanctuary of Mhlatzu, of great functional importance, notably for its fish and bird populations) and for tourism (recreational sites).

In addition to fuel removal operations, protection measures were implemented for sensitive shorelines, in particular for sites selected based on the results of numerical oil drift forecast modelling. Booms were positioned following discussions with the P&I Club's technical expert (ITOPF)[7] and were removed following bunker removal operations.

Furthermore, when the ship broke up, black plumes were observed in the water, composed of the finest particles of the cargo of coal. The cargo was neither toxic nor soluble and, according to the particle size, its expected behaviour was to spread from the wreck across the seabed and disperse at a varying rate according to the currents. ITOPF conducted beach surveys and reported blackish lumps: visually similar to coal, after testing they proved to be natural formations of lignite peat and titanium oxides.

Environmental monitoring of the potential impact of the cargo of coal was reported to have been initiated by the Department of Environmental Affairs (DEA). The stern section of the wreck was refloated and towed offshore where it was scuppered in October 2013 by Subtech Group and SMIT Salvage. Titan Salvage was contracted in late 2013 to implement refloating and towing operations on the fore section, buried in the sediment; these operations were completed by mid-December 2014.

This incident came shortly after that of the *Kiani Satu*, a 168 m bulk carrier (Antigua and Barbuda flag), which suffered engine failure and grounded 1,500 km further south at dawn on 8th August, in Buffels Bay (province of Western Cape). The incident occurred following unsuccessful mooring and towing attempts (in over 80 km/h winds and 5 m high waves) and after the evacuation of the 19 crew members by NSRI. Following the grounding, oil leaks could be seen, and SAMSA implemented an emergency tank-to-tank transfer (onboard capacities) of oily water and fuel from a leaking tank, pending the assessment of the possibility of removing the 330 tonnes of IFO 380 remaining on board.

Based on aerial surveys, DEA considered that the majority of the trails of oil were moving away from the coast. However, several kilometres of coastline (including 2 estuaries) required clean-up operations to be implemented.

[7] International Tanker Owners Pollution Federation


The Kianu Satu grounded in Buffels Bay, in challenging sea and weather conditions for response (source: NSRI)

Given (i) the logistical difficulties raised by the site's remote location and difficult access, (ii) the strong technical constraints (electric blackout, increasing difficulty in fuel pumping as it cooled) and (iii) the adverse sea and weather conditions (waves, currents, etc.), it was decided that the *Kiani Satu* would be refloated, an operation which was implemented on 17th August[8].

The bulk carrier was to be towed to Cape Town (after plugging its bunker tanks), however, due to leaks, it sank on 21st August in waters 1,000 m deep, around 100 nautical miles off the coast. Aerial surveys conducted by DEA showed the absence of oil upwellings. According to a statement from the local authorities, the ship sank "very far and very deep and poses no serious environmental risk to the South African coast".

In total, the quantity of oil at sea, which decreased over the course of the first week, was estimated at around 50 m^3 by SAMSA. In terms of impacts, around 150 oiled birds were collected on the shoreline following the incident. In a press release, the town of Knysna reported the death of 8 penguins, 3 seals and 14 cormorants.

Molasses spill in a harbour (Matson Navigation Co., Honolulu, US)

On 8th September 2013, a leak from a Matson Navigation Co. pipeline under a pier in Honolulu Harbor (Hawaii, US), led to a spill of around 880 m^3, i.e. approximately 1,400 tonnes, of molasses in the harbour waters.

An incident command post was immediately established and was comprised of representatives from the Hawaii Department of Health, Department of Land and Natural Resources, Department of Transportation, Matson, Coast Guard (USCG), Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA) and U.S. Fish and Wildlife Service (USFWS).

Denser than water, the molasses rapidly formed a brownish submerged plume close to the seabed. The plume's spread was monitored visually by aerial surveys. It spread as far as the nearby Keehi Lagoon.

Although non-toxic, the presence of such a large quantity of this organic substance in the environment led to the visible mortality of thousands of fish and marine invertebrates, probably due to a temporary depletion of dissolved oxygen in the water. To the best of our knowledge, no recovery operations were implemented. The molasses was left to be naturally eliminated (dilution and biodegradation), which took around ten days, during which surveys (visual and by divers) were conducted. The dissolved oxygen concentrations were also monitored by the Department of Health (Clean Water Branch) from Honolulu Harbor to Keehi Lagoon and announced to have returned to normal by 20th September.


Aerial view of the submerged plume of molasses, 3 days after the spill, near Keehi Lagoon (Honolulu, Hawaii, US) (Source: State of Hawaii Department of Health)

For further information:
http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/Honolulu-Harbor-Molasses-Spill-September-2013

Fuel oil spill following typhoon Haiyan (Yolanda): PB103 (Philippines)

On 8th November 2013 in the Philippines, the severe typhoon Haiyan (known locally as Yolanda) caused the grounding of a power barge belonging to the National Power Corporation (NAPOCOR)[9], a 65 m-long floating power station (32 megawatts) torn from its mooring (some 200 metres from the

[8] By the company SMIT Amandla Marine
[9] Placed under the authority of PSALM (Power Sector Assets and Liabilities Management Corporation), itself under the Department of Energy.

shores of Barangay Botongon), on the coast of Estancia (Iloilo province).

Carrying 1,400 m^3 of heavy fuel oil (Bunker C) at the time of the incident, Power Barge No. 103 (PB103) released an estimated 150 to 200 m^3 of fuel oil over the first days, escalating to an estimated total of 900 m^3 (high end of the bracket) by late November[10].

From the onset, the typhoon – one of the most violent ever to hit the region – destroyed many of the island's homes and infrastructures and caused many victims. Rescue operations were therefore naturally the main priority of emergency management. Spill response was therefore implemented in difficult circumstances, given the lack of available resources (personnel and equipment) but also the technical difficulties (shoreline strewn with a wide variety of debris) and health issues (many inhabitants along contaminated coastline).

According to the Philippine Coast Guard (PCG), the barge's crew immediately attempted to contain the leak by laying around 100 m of boom. The PCG Sub-Station in Estancia reinforced this protection by deploying its own floating booms, while conducting an initial survey of the structure of PB103, which confirmed a continuing leak from the bottom of the ship. Based on this information, the regional PCG (Western Visayas) mobilised equipment for containment/recovery on the water (floating booms, vacuum trucks, power packs, pumps, skimmers, etc.), as well as for dispersant spraying (unspecified equipment)[11]. Meanwhile, the provincial government created Task Force PB 103, placed under the auspices of PCG, to supervise the emergency spill response.

Despite these containment operations close to the source of the spill, oil rapidly washed up along a relatively short stretch of shoreline: 1 to 2 km heavily oiled over the first few days, extending to around 10 km south over the following 2 weeks (with lighter and more discontinuous scattered oilings).

The polluted areas included sedimentary habitats (comprising a few mangroves) and rocky habitats, as well as residential and industrial areas, where the devastation of infrastructures caused the shoreline to be strewn with vast amounts of debris of varying types and dimensions.

The emergency response priority focused on recovering oil contained on the water, using various types of pumping equipment (in some cases together with skimmers), but also manually, from small boats (sometimes using makeshift sorbents such as rice straw for instance).

*Pollution near the leaking barge: floating oil, oiled hard substrates (rocks, concrete walls) and accumulated debris (**left**); Containing fuel oil pushed against infrastructures (**centre**); Recovery by pumping and skimming (Elastec oleophilic grooved drum skimmer) (**right**) (source: Cedre).*

[10] On 21st November, NAPOCOR estimated the volume spilt at 800 m^3, close to previous estimations (900 m^3 maximum) by the UNEP/OCHA/WHO experts deployed on site.

[11] NB: several press sources mention the use of dispersants, close to (or on) the shoreline of Botongon, although no official confirmation or details are available in our information sources.

On the shoreline, initial efforts to remove the bulk of the oil[12] were supervised by PCG. This involved various personnel, in particular local inhabitants (paid), and drums and containers were provided for primary waste storage by the local government as well as by Philippine industrial companies keen to support NAPOCOR[13].

Mid-December: manual recovery using natural sorbents (rice straw) (source: Cedre)

Another emergency was the fuel removal and towing of the barge, the options for which were jointly assessed by the authorities and the operators of the PB103. These operations were slightly delayed due to the recent sale of the barge to a third party (Salcon Power Corp.) and the Philippine authorities asked NAPOCOR to take responsibility for them.

On 21st November, following a tender NAPOCOR and PSALM contracted Kuan Yu Global Technologies (KYGT) to implement, within 48 hours, the necessary operations to (i) remove the oil from the wreck and refloat it, (ii) clean the shoreline and (iii) manage waste up to and including its complete elimination.

Meanwhile, the complexity of the emergency management led the Environmental Management Bureau (EMB, under the Department of Environment and Natural Resources, DENR) to request international expertise in this area. This expertise was provided from 28th November to 23rd December via the Joint UNEP-OCHA Environment Unit[14] and the European Commission's Humanitarian Aid and Civil Protection department (ECHO) through its operational centre (ERCC[15]). An expert from Cedre was deployed through this joint initiative to conduct surveys and advise EMB on clean-up operations as well as any environmental impact assessment actions.

At the beginning of December, PCG requested support from the Japanese Coast Guard, which deployed experts on site and provided booms and waste storage equipment, as well as from a private consultant.

Based on the shoreline surveys conducted by the UNEP/OCHA team, jointly with representatives of PCG, KYGT and the P&I club's technical expert (ITOPF)[16], the priorities could be defined and advice be provided on clean-up techniques. Overall, the main priorities (requiring operations such as manual recovery, rinsing, pressure washing, sorbents, etc.) concerned the 1 to 2 km stretch of heavily oiled shoreline close to the barge, which was also the most sensitive area in terms of the number of inhabitants and its uses (port facilities).

***Left**: 19/12/2013 (40 days post-spill): weathered oil pollution left to be cleaned naturally (village of Salong, Batad); **Right**: 15/12/2013 (36 days post-spill) lightly oiled shrubs in a mangrove area (Embarcadero) (source: Cedre)*

For the rest of the shoreline, to the south, the low degree and discontinuous scattered nature of the pollution, as well as the inaccessibility and environmental sensitivity of the sites (mangroves) led the experts to recommend leaving these areas to be cleaned naturally. The effect of natural clean-up could be seen from mid-December in several areas.

According to EMB, between 7th and 15th December, 470 m^3 of heavy fuel oil was pumped out of the barge's bunker tanks, and 340 m^3 pumped from the water surface from within the booms surrounding the wreck, and transferred to the small tanker *Obama* mobilised by KYGT. According to these estimations, the maximum possible amount of oil to have washed up on the shore was 500 m^3.

12 We note however that shoreline clean-up operations escalated from mid-December, after the pumping of the fuel oil remaining on board the barge by KYGT (see below). Prior to this, on 6th December, several press sources reported the collection of 60 tonnes of oiled debris and 170 m^3 of oil (without any further details).

13 In particular Petron Corp and Pilipinas Shell Petroleum Corp.

14 United Nations Environment Programme / Office for the Coordination of Humanitarian Affairs.

15 Emergency Response Coordination Centre, activated under the EU Civil Protection Mechanism.

16 International Tanker Owners Pollution Federation Ltd.

The solid waste recovered on land (estimated quantities not available in our information sources) was stored in bulk, in drums or in bags – according to its dimensions – on board a barge, before being taken to a facility in Meycauyan City (province of Bulacan), selected for the treatment and disposal of the collected waste.

__Left__: storage of the fuel oil recovered on board and around PB103, before being transferred to the tanker Obama (in the background); __Centre__: bags of oiled waste; __Right__: barge mobilised to evacuate solid waste (source: Cedre)

In this context of a natural disaster, the authorities decided, around a fortnight after the incident, to evacuate some 500 families (around 2,000 people) living near to the leaking barge, due to the health risk feared by the Department of Health, based on their measurements of light volatile compound concentrations in the air from the fuel spill.

In this respect, PSALM announced the provision of a fund totalling 1.5 million Philippine pesos (PHP) to the Iloilo Provincial Government for the management of residents forced to evacuate the affected area, and PHP500,000 to the municipality of Estancia (compensation for families living near the barge grounding site).

The residents were provided with temporary accommodation in various structures (e.g. Northern Iloilo Polytechnic State College) and were allowed to return to their homes on 19th December, 40 days after the spill.

No visible environmental impact (e.g. mortalities of molluscs, fish, etc.) was reported following the spill. The mangroves affected were covered with an oily film. Defoliation and mortalities of young trees, believed to be caused by the typhoon, were observed. In late December, EMB announced its intention to implement a 3-month environmental impact assessment[17] to (i) check that the air contamination (Estancia) and coastal water contamination (10 selected sites) was returning to normal and (ii) check for the absence of medium term effects on exploited resources (analysis of PAH content in organisms by the Bureau of Fisheries and Aquatic Resources, BFAR, and the University of Iloilo) and mangrove vegetation.

The BFAR also indicated that it had started an inventory of affected fishermen, in particular by recording oiled fishing boats and equipment (in particular in the villages of Embarcadero, Batad, where many fixed fishing nets (*puenots*) had been oiled).

From the beginning of December 2013, various questions were raised by the provincial government over the progress of clean-up operations. In January 2014, visits to clean-up sites by Task Force PB 103 led the Governor of the province to express his dissatisfaction, and to consider legal proceedings against KYGT and PSALM (including the associated public entities NAPOCOR and the Department of Energy). In 2014, a House Committee on Energy was tasked with assessing the spill response and the contracting process for the implementation of the response. This assessment is still in progress at the time of writing (according to the press, hearings were scheduled in the last quarter of 2014).

One year after the incident (October and November 2014), the Philippine Government (through PSALM) divided PHP3.5M then PHP3.29M (around €70K and €66K) between hundreds of recipients, in compensation for damages and evacuation during the spill (subject to agreement to abandon all further legal action). Further such compensation should follow as part of a collective complaint filed by local residents, against the relevant government agencies and KYGT (accused of "negligence" and "inefficient" clean-up operations).

For further information:
http://www.humanitarianresponse.info/system/files/documents/files/Philippines_Oil_Spill_Mission_Report_small.pdf

[17] Whose results are unknown to us.

Repeated spills in the Caribbean: Petrotrin facilities (Trinidad and Tobago)

On 17th December 2013, a leak from a sea line at an oil terminal led to the release of around 1000 tonnes of bunker C fuel oil into the coastal waters of Trinidad and Tobago (1 to 2 km off Pointe-à-Pierre). This leak was initially thought to be due to a malfunction of the line during loading of the barge, however initial indications from the investigation in progress pointed to sabotage as a likely cause. The incident was followed, the same day and over the following weeks, by over 10 spills from facilities run by the same operator (of which at least 2 were officially suspected to be due to sabotage).

Whatever the cause, this spill required, in this controversial context, operations to be implemented at sea (chemical dispersion), as well as clean-up operations along a 6 km section of shoreline in the La Brea region, on various sites, sometimes difficult to access or ecologically sensitive, comprising various substrates (infrastructures, sandy beaches, mangroves, etc.).

This series of spills led to the activation of the National Oil Spill Contingency Plan (NOSCP) on 18th December, first at tier 2 with the establishment of an Incident Command Team gathering representatives of the relevant administrations (and American agencies), then on the 22nd at tier 3, providing for the integration of foreign resources.

For the Pointe-à-Pierre spill, the authorities contracted OSRL (Oil Spill Response Limited) on 21st December to conduct surveys and provide technical assistance on site for shoreline clean-up, with the mobilisation of resources (from its Fort Lauderdale base in Florida) and personnel for around a month.



Organisation of the shoreline recovery chain: ***Left:*** *manual collection with support from mechanical equipment;* ***Centre:*** *primary storage (lined pit) temporarily established on the back beach;* ***Right:*** *pumping of fuel oil (vacuum trucks) prior to transfer to the treatment site (source: www.petrotrin.com/)*

• Review of spills having occurred worldwide in 2013

Oil and HNS spills, all origins (Cedre analysis)

• Volumes spilt

In 2013, Cedre recorded 28 spills involving volumes of over approximately 10 m^3, for which sufficient information was available for statistical analysis. Half of these spills occurred at sea, 20% on the shoreline, almost as many in ports and finally 10% in estuaries (Fig. 1).

While the number of spills reported in 2013 was similar to the annual median (29 incidents) calculated for the 2004-2012 period, the cumulated quantity of oil and other hazardous substances spilt, around 66,000 tonnes, ranks among the highest recorded over the previous 10 years (Fig. 3). Having said that, this observation must be balanced against the relatively high contribution of a single incident in 2013, involving the loss of 50,000 tonnes of coal in the coastal waters of South Africa (see above).

Overall, the significant spills in 2013 considered here give a median quantity of around 70 tonnes.

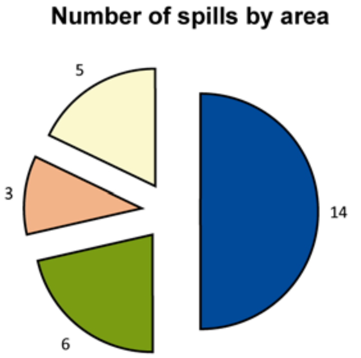

Figure 1

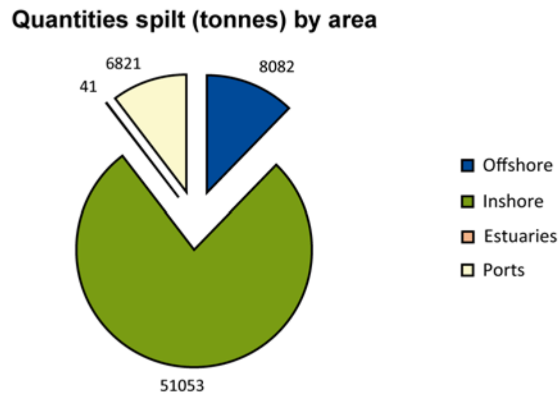

Figure 2

The majority (78%) of the quantities spilt in 2013 were released into coastal waters (Fig. 2), mainly due to the grounding of the bulk carrier *Smart* in South Africa (and, to a far lesser extent, the incident of the NAPOCOR barge in the Philippines; see above).

Spills in offshore marine waters (mainly due to the incident involving the chemical tanker *Yong Win 3* in Taiwan)[18] and ports (mainly related to the incidents involving the oil tanker *Patriot Andalan* in Indonesia and the Matson Navigation Co. terminal in Hawaii (see above)) represented comparable shares, of around 10%, of the annual total.

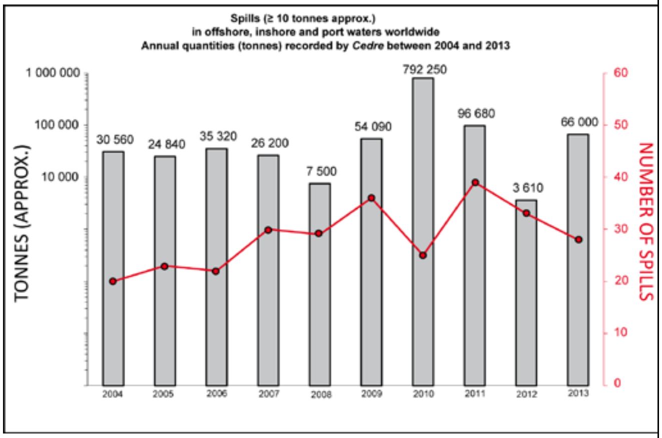

Figure 3

• Spill locations

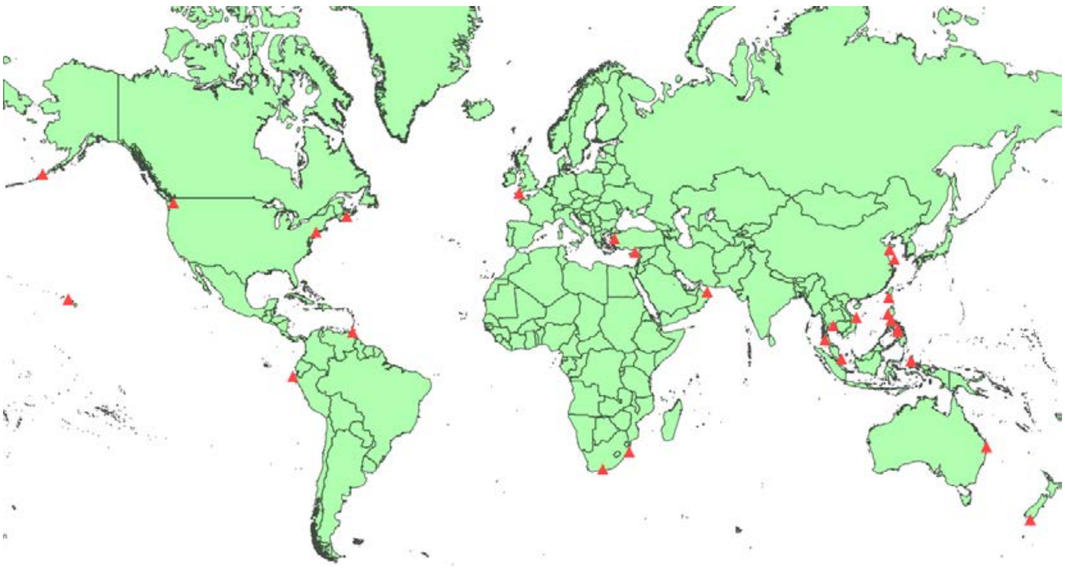

Figure 4. Location of oil and HNS spills (≥ approximately 10 tonnes) offshore and inshore in 2013 recorded by Cedre.

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[18] Chemical tanker registered in Honduras (DWT 11628; built 1993) which capsized for unspecified reasons on 15th October 2013, 35 km south-west of Little Liouchiou (off Taiwan), sinking with its cargo of 5,000 tonnes of diesel on board.

• Incidents leading to spills

The most frequently reported incidents in 2013 were **structural breaches or ruptures**:

- Most of such incidents were due to vessel **strandings and groundings** (25% of incidents, Fig. 5) which also represented the largest share (23%) of the total volume spilt in 2013 (mainly due to the grounding of the *Smart* in August) (Fig. 6). **Shipwreckings/losses** at sea from ships represented 18% of incidents (Fig. 5) and the third largest share of the volume spilt during the year (Fig. 6).
- **Loss of integrity** of various structures, in this case pipes within land-based industrial or offshore oil facilities (terminals, loading buoys) and pipelines (overland or subsea) represented 18% of incidents, with however a modest contribution to the overall quantity spilt in 2013 (Fig. 6).
- **Collisions between ships** which, although they represented around 10% of events, only contributed to around 1% of the total annual quantity.

No information on the incident having caused the spill was found in 14% of the cases listed.

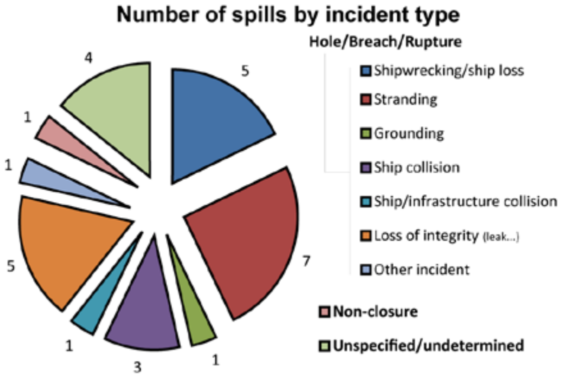


Figure 5

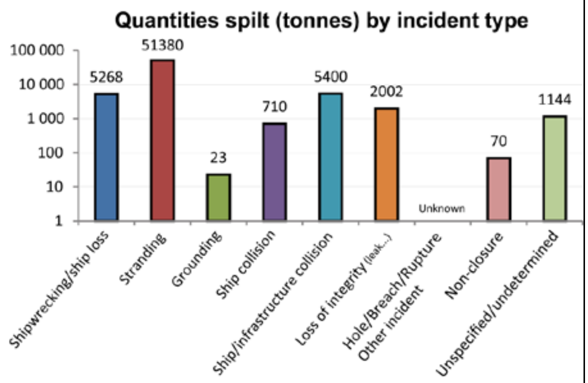


Figure 6

In terms of contributions to the total quantity spilt in 2013, we note the contribution of **ship collisions with infrastructures**; with only one single occurrence (Fig. 5), these incidents do not feature among the most frequent events identified but the incident in question caused a major spill of over 5,000 tonnes of diesel, in an Indonesian port in July.

• Spill causes

Analysis of the distribution of cause frequencies shows that, in the majority of cases (>60%), the cause is unknown or unspecified (Fig. 7) and, what's more, these incidents make up the vast majority (80%) of the annual total (Fig. 8; we note that this share is mainly attributable to the grounding of the bulk carrier *Smart*). This lack of detail therefore makes it difficult to accurately estimate the main causes, although we can note the frequency of **technical failures** (17%, mainly due to the **defectiveness/dilapidation** of facilities, or **engine failure** of vessels) which is higher than that estimated for **atmospheric conditions**, **human errors** and **external interference** (sabotage) (Fig. 7).

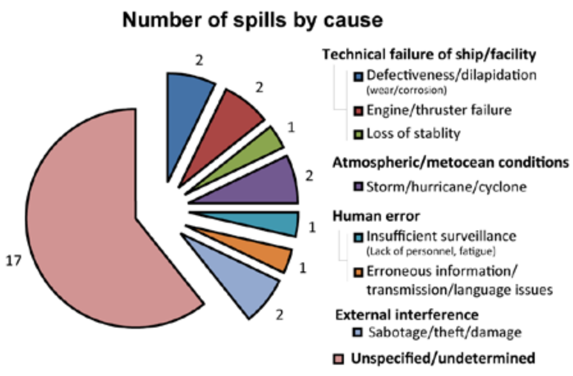


Figure 7

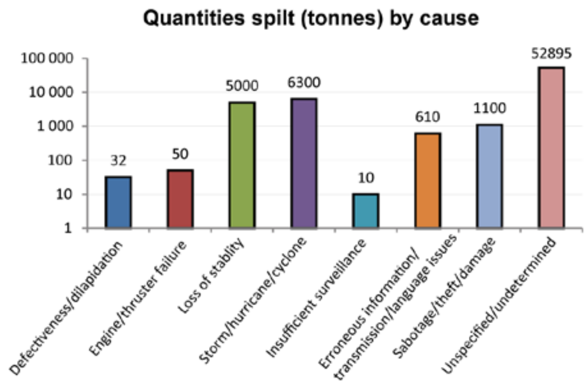


Figure 8

• Substances spilt

Among oil spills (over 90% of occurrences in 2013), the most frequently spilt substances (32%) were **white products**, followed by **heavy fuel oils** (IFO≥380) and **intermediate fuel oils** (grades

IFO<380 of unspecified), each involved in 18% of cases. These are followed by **unspecified oils** (14%) and **crude oils** (11%) (Fig. 9).

Aside from oil products, we note a single case in the category of **coal derivatives** (the cargo of coal from the *Smart*, see above), and one incident involving a liquid bulk foodstuff.

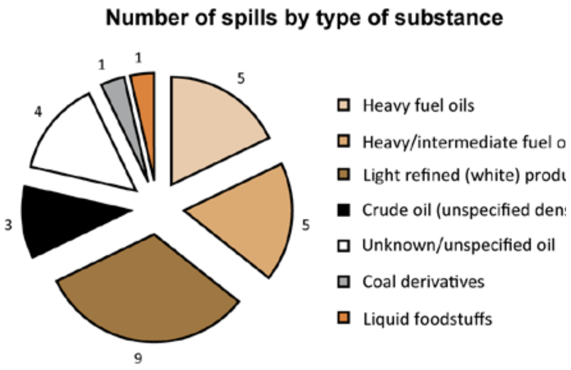


Figure 9

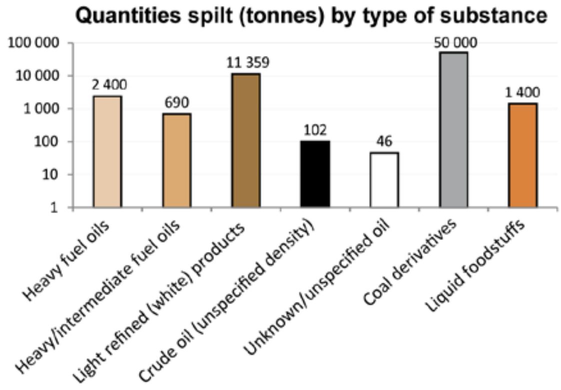


Figure 10

In terms of the quantities spilt by type of product, we note the predominant share of **coal derivatives** in the 2013 total, due to the loss of the cargo of coal of the *Smart* in the coastal waters of South Africa (Fig. 10).

The most predominant oil category is that of **white products** (17% of the annual total), followed by the other categories (intermediate to heavy fuel oils, crude oils and finally unspecified oils), all of which represent less than 5% of the annual total (Fig. 10).

Finally, 2013 saw few spills of over 10 m^3 of hazardous and noxious substances (HNS) in offshore or coastal waters. We note the spill, in the **liquid foodstuff** category, of 1,400 tonnes of molasses from a pipeline in Honolulu Harbor, US (see above).

Ship-source oil spills in 2013: ITOPF statistics

The 2013 statistics provided by the International Tanker Owners Pollution Federation (ITOPF) on ship-source oil spills once again confirmed the downward trend of major spills by ships observed from one decade to the next since the 1970s.

Three oil spills of over 700 tonnes were reported by ITOPF for 2013, with one major incident: a spill of 5,000 tonnes of diesel oil following the capsizing of the chemical tanker *Yong Win 3* in Taiwanese waters. Furthermore, with 4 moderate spills (between 7 and 700 tonnes according to the ITOPF categorisation), the number of spills in 2013 was far lower than the annual mean calculated for the previous four decades (even although it is not the lowest number of annual incidents).

According to the reported figures, the total volume of oil spilt by ships in 2013 was around 7,000 tonnes, i.e. 7 times that estimated for 2012 (around 1,000 tonnes).

For further information:
http://www.itopf.com

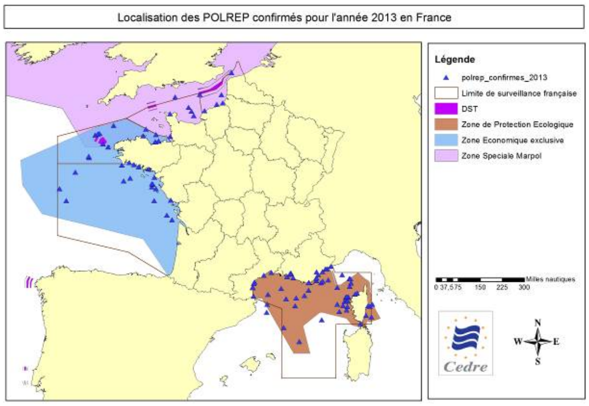
• Summary of illegal discharges

Pollution reports: analysis of 2013 POLREPs (mainland France)

Since 2000, upon request by the French authorities (*Secrétariat Général de la Mer*), Cedre has been drawing up an annual summary of POLREPs (Pollution Reports) in the waters under French jurisdiction, submitted by the Maritime Rescue Coordination Centres (MRCCs) - directly until 2010 and since then via the French maritime database *Trafic 2000*. Despite inter-annual variation in observation pressure, the 2013 data add to the analyses conducted over the previous decade.

The analysis of 2013 data shows:

- a total of 118 confirmed POLREPs, close to the 2012 total (113), confirming the downward trend described in previous years (292/year on average for the period 2000-2012)[19].
- the distribution once again of the majority of POLREPs off the Mediterranean coast, where 54% of reports were made.
- like previous years, oil was the most frequent category of pollutant with a confirmed presence in 70% of POLREPs (like in 2012).
- in 2013, the origin of the discharge was determined in 29% of confirmed POLREPs (compared to 18% in 2012), an increasing percentage for the 2nd year running.



Location of confirmed POLREPs in 2013 in France (Source: Cedre)

The distribution of POLREPs between and within France's different coastlines is consistent with the usual pattern, closely related to shipping routes in the Channel (Ushant and Casquets traffic separation schemes) and the Mediterranean (routes between Genoa and Catalonia on the one hand and Marseille on the other; around the Corsican coasts due to the Genoa-Strait of Messina route but also Marseille-Corsica).

The monthly evolution of the number of reports issued in 2013 is similar to that described for the 2000-2012 period, with the usual summer peak (around 30 POLREPs in July), and relatively "low" period on either side (May/June and September).

Based on the 60 confirmed POLREPs for oil including surface area data, the average area of slicks/sheen was calculated to be around 4.5 km^2, a value close to the mean expressed for the 2000-2012 period (5 km^2). According to the Bonn Agreement Oil Appearance Code, indicated for around 30 of these POLREPs, all the discharges reported can be situated within the range from 4 to 25 m^3, i.e. a larger spectrum than in 2012 (1-8 m^3) and including greater volumes.

For further information:
Cedre report R.14.12.C "*Analyse et exploitation des POLREP reçus au Cedre pour l'année 2013*".

• Response preparedness

Arctic: oblique ice-breaker *ARC 100* fitted out for spill response

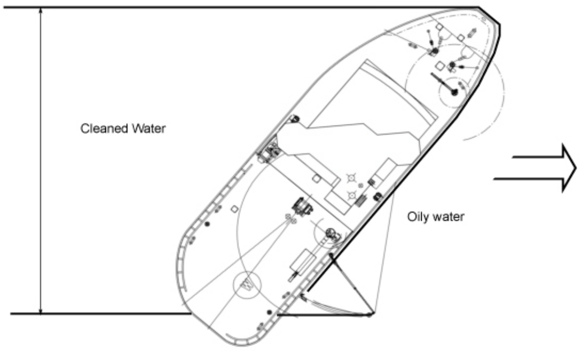
The Finnish firm *Aker Arctic*, specialised in the conception and construction of ice-breakers, recently developed a new vessel concept baptised *ARC 100* designed for use in thick ice (thick first-year ice). Its originality resides in the asymmetrical shape of the hull which, propelled by specific thrusters, is designed to operate obliquely in order to generate a channel through the ice twice as wide (50 m, in over 1 m-thick ice) as that of a conventional ice-breaker.

The construction of a 76 m-long prototype, the *Baltika*, fitted with oil spill response equipment, began in 2013 (shipyards OJSC Yantar in Kaliningrad and ArchTech in Helsinki), following an order placed by the Russian Ministry of Transport, due to be delivered in early 2014.

[19] excluding the *Erika*, *Tricolor* and *Prestige* spills.

The starboard side of the vessel, which acts as sweeping arm along its entire length as the vessel moves sideways (see diagram on the right), is fitted with a boom at the rear to funnel the oil towards an integrated recovery system then a settling/storage system on board. The ice-breaker acts as a large sweeping arm (with a swath width of around 50 metres) which is operational in heavy ice conditions.

For further information:
http://akerarctic.fi/en
http://akerarctic.fi/en/references/built/baltika-aker-arc-100



source: Aker Arctic Technology Inc

Response at sea: EMSA focuses

In January 2015, the European Maritime Safety Agency (EMSA) announced the conclusion of the procurement procedure for 4 new spill response vessels, intended to boost its response capacity in the Atlantic, northern Black Sea and Channel/North Sea areas. The selected vessels are respectively an offshore support vessel based in Galicia, a Romanian oil tanker (based in Constanta) and adapted to recover substances with a flash point below 60°C and 2 dredgers based in Ostend. Technical adaptations are currently being made to these ships, which are expected to be in operational service by mid-2015. For a review of the current state of the EMSA fleet, we remind readers that the agency published an updated list of its network of stand-by oil spill response vessels in autumn 2014.

In December 2014, EMSA also launched a procurement procedure to contract one or more private or public entity, specialised in aerial dispersant application services. EMSA was seeking an organisation able to operate all around the European coastline, in compliance with the regulations in force, with a certain number of technical prerequisites relating to the aircraft's capacity (minimum payload of 4 tonnes of dispersant per flight) and potential scope of action (e.g. maximum mobilisation time of 12 hours, determined minimum cruising speed and flight range at maximum payload, etc.). The application procedure is scheduled to close on 23rd February 2015.
Again on the theme of chemical dispersion, in October 2014 EMSA also updated its inventory of (i) member States' national policies (testing and approval procedures, national rules and regulations for usage of dispersants at sea) and (ii) the resources available within stockpiles (dispersants, equipment).

For further information:
http ://91.231.216.7/oil-recovery-vessels/opr-documents/opr-inventories/item/1439-network-of-stand-by-oil-spill-response-vessels-and-equipment-handbook-2014.html
http ://www.emsa.europa.eu/index.php?option=com_flexicontent&view=item&cid=111:on-going-calls-for-tenders&id=2292:emsa-op-13-2014&Itemid=132
http ://www.emsa.europa.eu/emsa-documents/latest/item/618-inventory-of-national-policies-regarding-the-use-of-oil-spill-dispersants-in-the-eu.html

Illegal discharges in the Mediterranean: the OSCAR-MED surveillance operation and the MENELAS network of law enforcement officials

Five planes were involved in the 2013 coordinated aerial surveillance operation for illicit ship pollution in the Western Mediterranean (OSCAR-MED), organised from 24th to 26th June by REMPEC (Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea). The operation ran continuously (night and day) across an area from the Balearic Islands to Gibraltar. France and Italy took part in this operation through the RAMOGE Agreement (between France, Monaco and Italy) alongside Spain, Morocco and Algeria. This was the second such operation, the first having taken place in 2009 with 3 planes from France, Italy and Spain.

Supported by funding from France and the RAMOGE Agreement (Saint-Raphael, Monaco and Genoa), the operation aimed to improve regional cooperation in terms of response to illegal discharge. OSCAR-MED 2013 was coordinated by the Spanish agency SASEMAR (*Sociedad de Salvamento y Seguridad Marítima*), from its naval air station in Palma de Mallorca (Balearic Islands), and received support from EMSA's satellite image analysis service CleanSeaNet.

Twelve flights totalling 44 flying hours were operated, during which no less than 700 ships were monitored. Three oil slicks were identified during this 3-day operation, which was also the opportunity for REMPEC and the Blue Plan Regional Activity Centre (under the UNEP[20] Mediterranean Action Plan) to organise a forum on the establishment, under the Barcelona Convention, of a Mediterranean Network of Law Enforcement Officials (MENELAS).

Thirteen Contracting Parties to the Barcelona Convention were represented at this meeting, which provided the chance to discuss, amend and approve the terms of reference put forward by the network's Secretariat (REMPEC, pending the approval of Contracting Parties) for the implementation of this regional initiative.

For further information:
http://www.rempec.org/admin/store/wyswigImg/file/News/Forthcoming%20Meetings/Network%20of%20Law%20enforcement/WG%2033_8%20RAPPORT%20%28FR%29%20consolid%C3%A9.PDF

• Recovery

Oleophilic 'tufted' discs and recovery of viscous oils (Vikoma OPRS 300)

In 2013, the UK-based manufacturer Vikoma extended its range of skimmers with the high-speed OPRS 300 (Oil Pollution Recovery System) designed primarily for use offshore.

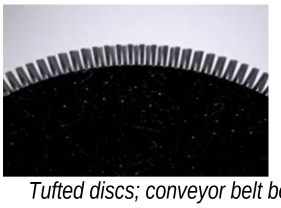
OPRS 300 skimmer head (source: Cedre)

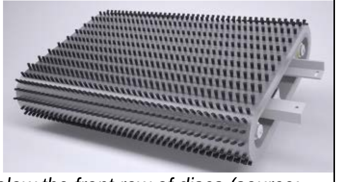
The skimmer head is fitted with 3 rows of oleophilic discs, and comprises a pump allegedly capable of collecting up to 300 m^3 per hour, a significantly higher rate than that indicated for the manufacturer's other models based on this principle[21].

Designed to optimise the recovery of viscous oils, the outer edge of each disc features brushes, Vikoma's so-called 'tufted disc technology', and a brushed conveyor belt is housed under the front row of discs. An annular water injection kit, at the discharge pipe, completes the system.

This skimmer is propelled by 2 remote-controlled thrusters and is an integral part of a system including a power pack and a reel-mounted umbilical containing the hydraulic circuits and other hoses.

For further information:
http://www.vikoma.com/





Tufted discs; conveyor belt below the front row of discs (source: Vikoma)

Extreme Spill Technology recovery barges and vessels

The Canadian firm Extreme Spill Technology (EST) has recently developed a recovery barge concept comprising a vacuum oil separation system. The performance of a 12 m-long model, built for the Canadian Coast Guard, was assessed during tests at OHMSETT in September 2012[22].

[20] United Nations Environment Programme

[21] By way of comparison, the Komara 50 (largest model in the Komara range of oleophilic disc skimmers) is publicised as having an rate of 50 m³/h.

[22] Tests were also carried out in August 2012 in China, upon request by the Chinese Coast Guard and Maritime Safety Administration, with Bunker C fuel oil.

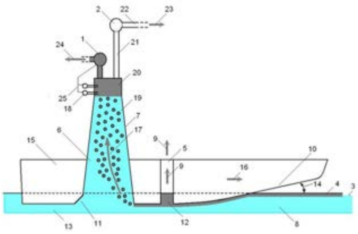


Diagram showing how the EST barge works (Source: EST)

This vessel takes the form of a small catamaran which concentrates the oil between its floats as it moves forward, then submerges it and channels it towards one or more internal tanks (according to the barge dimensions) where gravity separation of the oil occurs (see diagram on left). These tanks are topped with a removable oil recovery vacuum tower housing a system to pump and transfer the collected oil towards an internal (ballasts) or auxiliary storage capacity.

The origin of this prototype dates back to 2005, initiated by Dalhousie University (Halifax), and its development benefited from funding from a Norwegian firm and the National Research Council of Canada.

This principle is reminiscent of that of the barges developed a few years ago by another Canadian firm SMAVE Environmental, which were a variation of the Pelican concept (created over 30 years ago by the French company Bagnis and marketed in the 2000s by the Canadian firm Hewitt Environmental).

Tests on a 12 m model in the OHMSETT test tanks (right, view of the removable vacuum tower and the transfer system) (source: EST)

According to the manufacturer, the simplicity of the prototype's structure means that it requires minimal maintenance and is very robust. Unlike other concepts, this does not include a system creating a surface current to draw the oil into the vessel (water jets), an oil submersion system as the barge moves forward (e.g. partially submerged conveyor belts) or a sweeping arm at the bow. The tests performed at Ohmsett, in various conditions (e.g. with and without agitation, speed of between 1 and 4 knots, etc.), indicate good performances (oil recovery rate often over 60%), limited however by agitation of the system, due to the sea state.

For further information:
http://www.spilltechnology.com/
http://www.spilltechnology.com/library/EST_R&D_Rev2.pdf

• Slick drift

Numerical simulation: the OILTRANS model and its application to the Celtic Sea

The ARCOPOL project (Atlantic regions' response to coastal pollution from shipping), funded by the European Regional Development Fund (ERDF) under the transnational "Atlantic Area" programme, recently led to the development by the Marine Institute in Galway (Ireland) of an operational system, known as OILTRANS, designed to model the trajectory and behaviour of oil spills at sea. This is an open source system currently designed for application to the Celtic Sea.

It is based on an existing system (LTRANS, simulating the influence of particle advection and turbulence on the dissemination of planktonic bivalve larvae), which it adapts to integrate various processes influencing the fate of the oil, such as their spreading (mechanical), their drift under the influence of wind and various physical phenomena in the surface layer (Stokes drift, Langmuir circulation), etc.

OILTRANS, which also includes an oil database, aims to provide an estimation of the oil mass balance (volume remaining at the surface, evaporated, dispersed, emulsified, on the shoreline, etc.), which can be viewed in cartographic form through the geographic information system ArcGIS (formerly ArcView GIS).

The system developed, accessible online, is the focus of a scientific paper (see link below) which describes the model's design and its application to a real incident (fuel oil spill in the Celtic Sea from the Russian aircraft carrier *Admiral Kutzenov* in February 2009; see LTML n°29), which confirmed the consistency between the results obtained and in situ observations.

For further information:
http://dx.doi.org/10.1016/j.marpolbul.2012.07.036

http://www.arcopol.eu/?/=/section/resources/sub/r_modelling_decision_support_tools/resource/41 http://www.arcopol.eu/?/=/section/resources/sub/r_modelling_decision_support_tools/resource/42

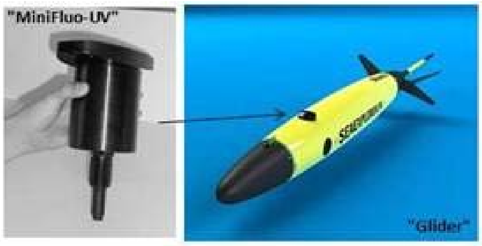
• In situ oil detection/monitoring

IBISCUS project: mini-fluorometer for continuous monitoring of organic pollutants

The Mediterranean Institute of Oceanography (MIO), under the supervision of the French National Centre for Scientific Research (CNRS), based at the University of Aix-Marseille, has developed a highly sensitive mini-fluorometer with low electricity consumption, for the detection and quantification of organic compounds indicating anthropogenic discharge in water.

This tool was developed as part of the IBISCUS project (on biological and chemical indicators of urban contamination in the marine environment)[23], funded by the French National Research Agency (ANR 2010-2013).

The IBISCUS project aimed to put forward continuous measurement technologies for organic pollutant markers (including PAHs) in coastal waters, based on their fluorescent properties.



Left: MiniFluo-UV; Right: view of the Sea Explorer glider (Source: CNRS)

Within this context, the MiniFluo-UV was designed and patented by MIO/CNRS for use on board small autonomous underwater gliders. This fluorometer, miniaturised for this purpose, is very compact, light-weight and has low electricity consumption.

In addition to its miniaturisation, this technology has the advantage, according to its developers, of being able to distinguish between fluorescent aromatic hydrocarbons and organic molecules to trace other discharges (e.g. sewage), with high sensitivity thanks to measurements at 2 wavelengths (2 UV light-emitting diodes at 250 nm and 280 nm).

For further information:
https://hal.archives-ouvertes.fr/hal-00817769/
http://woms13.univ-tln.fr/wp-content/uploads/2013/04/IBISCUS_Ecotechnologie_nov2012.pdf

• Industry initiatives

IOGP OSR-JIP project: revised IPIECA guides

As part of the Oil Spill Response-Joint Industry Project (OSR-JIP) launched in 2011 and led by IPIECA for the International Association of Oil & Gas Producers (IOGP), one work programme (JIP 12) is devoted to the revision of the series of IPIECA Good Practice Guides. Twenty-four documents are to be updated and rewritten as part of the JIP by March 2015. Eight have currently been revised and are available for download from the OSR-JIP website. These guides provide insight into the following themes:

- Oil spill training for incident management and emergency response personnel
- Sensitivity mapping for oil spill response
- Oil spill responder health and safety
- Oil spill waste minimization and management
- Oiled shoreline assessment (SCAT) surveys
- Incident management system for the oil and gas industry
- Oil spill exercises
- Wildlife response preparedness.

For further information:
http://oilspillresponseproject.org/

[23] Project co-funded by the projects FCE-Sea Explorer, Eco-Industrie VASQUE, CNRS EC2CO and supported by the PACA maritime cluster

In the absence of tests conducted or supervised by Cedre, we cannot guarantee the quality or performance of the response resources mentioned in the Technical Newsletter; the parties (companies, journalists, authors of articles and reports, etc.) providing the information bear sole responsibility.
Any mention by Cedre of a company, product or equipment does not constitute a recommendation and Cedre does not assume any liability with respect thereto.
The articles contained in the "Spills" section are based on information from various sources, in printed or digital form (specialised reviews and publications, specialised or general interest press, technical/scientific conferences, study reports, releases from press or institutional agencies, etc.). When a website or document containing a large amount of relevant information is identified, explicit reference is made thereto at the end of the article, under the heading "For further information".