



ISCO NEWSLETTER

The Newsletter of the International Spill Response Community

Issue 369, 28 January 2013

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International news

THE EUROPEAN UNION ANNOUNCES ITS ACCESSION TO THE BARCELONA CONVENTION'S OFFSHORE PROTOCOL

January 17 - The European Union has announced its accession to the Protocol for the Protection of the Mediterranean Sea against pollution resulting from exploration and exploitation of the continental shelf and the seabed and its subsoil.

With this new accession of the European Union, seven contracting parties would have approved the protocol, which entered into force on 24 March 2011. The Protocol had already been ratified by Albania, Cyprus, Libya, Morocco, Syria and Tunisia.

Management and monitoring of the protection of the Mediterranean Sea

The present protocol aims at establishing an effective management system to protect the Mediterranean Sea from pollution resulting from exploration and exploitation of the continental shelf, the seabed and its subsoil, and organizing a mutual assistance in cases of emergency. It also establishes a system of authorization, monitoring and strict liability in case of damage, with a view to limit impact on natural resources, biodiversity and population.

Praising the step forward taken by the European Union, Maria Luisa Silva Mejias, UNEP/MAP / Barcelona Convention Executive Secretary and Coordinator said: "major incidents experienced in some parts of the world, and linked to off-shore activities in ever deeper seas, have shown the necessity for common and higher regional standards to prevent the risk of acute pollution accidents. Through the implementation of this unique protocol, the parties to the Barcelona Convention are leading by example". UNEP/MAP



Maria Luisa Silva Mejias, UNEP/MAP and Barcelona Convention Executive Secretary and Co-ordinator

Incident reports

USA: SULPHUR DIOXIDE LEAK PROMPTS EVACUATION



Fire crews wearing special protective clothing prepare to enter the Tracy Wastewater Facility, 3900 Holly Drive, as they responded to a reported leak of sulfur dioxide at the plant on Wednesday, Jan. 16. Glenn Moore/Tracy Press

January 16 - Employees at the Tracy Wastewater Facility were evacuated Wednesday, Jan. 16, when sensors at the plant detected unsafe levels of sulfur dioxide.

Alarms at the plant, 3900 Holly Drive, began sounding shortly after 11 a.m. when a leak occurred during the unloading of sulfur dioxide from a tractor trailer and into a storage area at the plant, according to David Bramell, division chief with the Tracy Fire Department.

Hazmat technicians from the Tracy, Lathrop, Manteca and Escalon fire departments were sent into the plant to secure open valves on the tractor trailer and inside the plant, and to make a final conformation that the leak was contained.

The technicians are part of the San Joaquin County Joint Hazmat Team. Bramell said a team of eight to 10 technicians is needed any time a chemical spill is reported in the county. Tracy Press [Read more](#) [Thanks to Don Johnston of ISCO Industry Partner, DH & Hazmat Group]

BAHAMAS: BUNKER BARGE OVERFLOW CAUSES OIL SPILL OFF GRAND BAHAMA ISLAND

Photo: Tug Smit Humber with tankbarge Smit Inesita at Freeport, Bahamas - June 2010 [<http://www.shipspotting.com>]

January 22 - The Ministry of Environment and Housing was informed of an oil spill in Freeport Harbour due to an incident involving an overflow of light diesel from bunker barge, "Smit Inesita" to the Mt "Butterfly" just before sunrise. The Ministry is informed that once the overflow was noticed, the Mt Butterfly shut down the operation a half hour into the operation.

The government authorities in Freeport were informed and notified relevant personnel in New Providence.

It was reported that less than approximately 210 gallons of fuel was released between the "Butterfly's" port quarter and the "Smit Inersita's" port bow. The immediate concern of Borco was to contain the movement of the spilled fuel, so it went into defensive mode with its emergency crew putting booms in place around the source of the spill and extending booms to potential areas where the fuel could spread. *The Maritime Executive* [Read more](#)



USA: CONTROLLED BURN PLANNED FOR BAYOU SORREL OIL LEAK

January 19 - A contracted cleanup crew will conduct a controlled burn starting at 10 a.m. Saturday to clean up part of an oil leak from a ruptured pipeline at the Frog Lake Bayou Sorrel facility in Iberville Parish, according to U.S. Coast Guard spokeswoman Lt. Victoria Saxon.

Coast Guard, federal, state and local officials will be on hand to monitor the burn, she said, adding that the Coast Guard along with members from the Louisiana Oil Spill Coordinator's Office are supervising oil cleanup operations. The Coast Guard Marine Safety Unit in Baton Rouge received a tip on Jan. 9 about a ruptured pipeline near the Bayou Sorrel facility that leaked about 5,000 gallons of oil product before facility officials halted the leak, Saxon said.

To date, about 1,750 gallons have been cleaned up and recovered, she said. The controlled burn of the oil in the water will be conducted by American Pollution Control, the contracted cleanup crew of ORB Exploration, owners of the Bayou Sorrel facility, Saxon said. *The Advocate* [Read more](#) [Thanks to Don Johnston of ISCO Industry Partner, DG & Hazmat Group]

IVORY COAST: OIL TANKER HIJACKED OFF ABIDJAN

January 21 - Armed men have seized an oil tanker off Ivory Coast's main city, Abidjan, officials say. The Panamanian-flagged vessel, ITRI, was attacked as it prepared to deposit 5,000 tons of oil, the AP news agency reports.

Incident reports (continued)



The Panama-flagged tanker was hijacked off Abidjan, Ivory Coast with a crew of 16 on 16 January. The attack is believed to have occurred at 2200 hrs local time, however the precise position has yet to be confirmed, just as details of the hijack have remained sketchy. *The Maritime Executive* [Read more](#)

Gunmen Release Hijacked Tanker After Siphoning \$5 Million in Cargo

January 22 - Gunmen, who hijacked a fuel-laden tanker off Ivory Coast, have released the vessel today after stealing about \$5 million of the ship's cargo.

Fortunately none of the 16 crewmembers aboard the Panama-flagged ITRI were injured in the attack. According to the tanker's owner, Nigeria-based Brila Energy, the crew was locked in a dining room while the 'pirates' siphoned off the oil. *The Maritime Executive* [Read more](#)

PHILIPPINES: FUEL REMOVED FROM GROUNDED US NAVY SHIP

January 26 - A salvage team has removed all diesel fuel from the tanks of the USS Guardian which ran aground last week on the Tubbataha reef in Sulu Sea, the American Navy said.

The US 7th Fleet said approximately 15,000 gallons of fuel was safely transferred to the contracted Malaysian tug Vos Apollo during controlled defueling operations over the past two days.

No fuel has leaked since the grounding of the 68-meter USS Guardian, which is an avenger-class mine counter-measure vessel. *Sun Star* [Read more](#)

SPILLS FROM ROAD AND RAIL TANKER INCIDENTS, LEAKING STORAGE TANKS

Every month there are numerous reports of spills resulting from road tanker roll-overs, road traffic accidents, derailments and leaking tanks – so many that the ISCO Newsletter could not possibly report on them all. In any case, there is no need because ISCO Industrial Partner, the DG & Hazmat Group's Don Johnston does such a superb job in reporting on these and other incidents. Every few days Don publishes his 15 page Newsletter "Newsy Stuff" with many such reports.

Unfortunately I can't give you a direct link for downloading "Newsy Stuff" but you can get Don's newsletter by clicking on <http://tech.groups.yahoo.com/group/DangerousGoods/> and joining the DG & Hazmat Group.

Other news

INDONESIA: ENVIRONMENTAL GROUP TO REPORT TIMOR SEA OIL SPILL TO KPK

January 21 - An environmental group in Kupang, East Nusa Tenggara (NTT) said that it would file a report to the Corruption Eradication Commission (KPK) over alleged gratuities given by Thailand-based oil and gas producer PTTEP Australasia to a number of parties in Indonesia.

PTTEP Australasia is responsible for the Montara oil spill in the Timor Sea, off the northern coast of Western Australia.

The environmental group in question, Ocean Watch Indonesia (OWI), alleged that the oil and gas company had paid gratuities to certain individuals to prevent them from speaking about the magnitude of the damage from the spill. *Jakarta Post* [Read more](#) [Thanks to Don Johnston of ISCO Industry Partner, DG & Hazmat Group]

CANADA: BRITISH COLOMBIA OIL SPILL PLANNING

BC Provincial Government meets with industry to form "world-leading" oil spill plan

January 22 - The future of British Columbia's environment is on the table, with the British Columbia Provincial government and thirteen key stakeholder organizations, including representatives from the [BC Oil and Gas Commission](#), [Transport Canada](#), [Railway Association of Canada](#)) looking at it. The government said in a press release this morning that they brought stakeholders together to build a BC-made, "world-leading" spill response plan. Not everyone's convinced. *Vancouver Observer* [Read more](#)

Other news (continued)

Industry, province support polluter-pay principle in land-based spill-response plan



The Haisla First Nation's Kitimaat Village is seen in an aerial view along the Douglas Channel near the outlet of the proposed Northern Gateway pipeline in Kitimat, B.C., on January 10, 2012. Photograph by: Darryl Dyck, THE CANADIAN PRESS

January 23- Industry representatives emerged from a meeting with B.C. Environment Minister Terry Lake on Tuesday to say they support the concept of polluters paying to clean up hazardous spills, and are committed to produce a new and better land-based spill-response plan with the province.

"The expectation in this province is that operators will take care of their own cleanup," said Brenda Kenny, president of the Canadian Energy Pipeline Association. "That was a message that was loud and clear and very much received by industry."

As the province seeks an improved spill-response strategy, it is considering the idea of an industry-funded pool from which money could be drawn as necessary to clean up oil or other hazardous spills. *Vancouver Observer* [Read more](#)

SOUTH AFRICA: WHO PAYS FOR OIL SPILLS?

January 22 - Taxpayers could be forced to foot the bill of cleaning up the next big oil spill on South Africa's shores, a shipping law expert has warned.

Webber Wentzel partner and shipping law expert Gavin Fitzmaurice warned this would happen if the government didn't act quickly.

While the government has acceded to the first layer of cover of the International Oil Pollution Compensation Fund – a safeguard that will cover R2.5 billion of the funds required to clean up the next major oil spill – the legislation required to pay the fund the necessary levies from oil corporations to enable insurance cover has still not been passed. *IOL Scitech* [Read more](#)

USA: RESEARCHERS DEBATE OIL-SPILL REMEDY

January 22 - No aspect of the 2010 Deepwater Horizon oil spill in the Gulf of Mexico was more controversial than the decision to pump massive doses of chemical dispersant into the oil gushing from 1,500 metres down (see '[Deep cleaning](#)'). Advocates said that the mixture of solvents and detergent would separate the deep oil plume into finer droplets, speeding its breakdown. Critics feared damage to deep-water ecosystems.

This week, researchers at the Gulf of Mexico Oil Spill and Ecosystem Science Conference in New Orleans, Louisiana, are assessing the outcome — and sometimes drawing markedly different conclusions from the scant data. Industry scientists argue that the nearly three million litres of subsea dispersant worked as expected and caused minimal ecological damage. Dispersant, they say, should be a standard option for fighting future sea-floor blowouts. But other researchers say that applying dispersants at depth has not yet been proved to be effective, let alone safe. *Nature* [Read more](#)

USA: GAO: PIPELINE RESPONSE REFORMS NEEDED

January 23 - The nation's pipeline operators and the regulators who police them could take steps to improve emergency response to incidents like the explosion last month of a NiSource natural gas transmission in Kanawha County, the U.S. Government Accountability Office said Wednesday.

GAO reviewers said that the U.S. Department of Transportation should improve the quality of data it collects about emergency incidents so it can better evaluate current response actions.

The GAO also found that the department's Pipeline and Hazardous Materials Safety Administration, or PHMSA, needs to do more to share guidance to help pipeline operators make decisions about key emergency response technology. *Charleston Gazette* [Read more](#)

AUSTRALIA: CAN HUGE SHALE OIL DISCOVERY SOLVE AUSTRALIA'S ENERGY NEEDS?

January 24 - A property in South Australia may possess enough shale oil to make the country a self-sufficient energy producer and exporter, surveys commissioned by Brisbane-based Linc Energy indicate.

Citing independent reports based on drilling and seismic exploration data from independent consultants, Linc said the untapped Arckaringa Basin near the town of Coober Pedy could be sitting on the equivalent of anywhere between 3.5 billion and a stunning 233 billion barrels of oil.

Linc's managing director Peter Bond told Australian media that if the higher end of the estimate is accurate, it would be "several times bigger than all of the oil in Australia." *International Business Times* [Read more](#)

NEW ZEALAND: CONTAMINANT LEAK FROM RENA WRECK CONFIRMED

January 24 - Testing of the area around the sunken stern of the shipwrecked Rena has confirmed fears of elevated level of contaminants around the wreck.

But health officials in the Bay of Plenty are assuring the public this does not change the level of risk the wreck poses.

Divers for from the Rena recovery monitoring team have recently gained greater access to the Astrolabe Reef following more than a year of salvage operations which have restricted their access.

The presence of contaminants around the site had been expected and the samples are now undergoing further testing. *One News* [Read more](#)

USA: KIRTLAND AIR FORCE BASE RAMPS UP FUEL SPILL CLEANUP

January 18 - A Kirtland Air Force Base crew is in the final stages of testing a new machine it hopes will accelerate cleanup of a fuel spill that has contaminated southeast Albuquerque groundwater.

On a concrete pad just north of the base flight line, workers Thursday were testing a garden-shed-sized furnace officials say will begin within the next week to burn off jet fuel sucked from deep under ground.

"It's the next step in actually cleaning up the contaminants," said Col. John Kubinec, the base commander.

Officials note that this is not the final remedy for the longstanding problem, but rather an interim measure to remove some fuel from the ground while the Air Force and state regulators wrestle with the long-term problem of cleaning up the decades-old mess.... *ABQ Journal* [Read more](#)

People in the news

NEW BOARD APPOINTMENTS AT OSRL



In the picture - Left to right: Mr Jon Lay, Mr Roland Festor, Mrs Sophie Fallou, Mr Raphael Vermeir CBE

Mr Jon Lay, Global Emergency Preparedness & Response Manager (ExxonMobil), was formally appointed as OSRL's new Chairman during the EGM. He succeeds **Mr Lon Langlois** (Hess) who steps down after three years of leading the Board and ensuring sound strategic direction for the Company. **Mr Roland Festor**, Senior Advisor (TOTAL Africa), is newly appointed as a non-executive Independent Director for the term of one year. **Mrs Sophie Fallou**, General Manager Shipping Strategy (Shell), and **Mr Raphael Vermeir CBE**, President and Managing Director, Nigeria (ConocoPhillips), are appointed as non-executive Independent Directors for a further term of one year. [More info](#)

ISCO MEMBERS AT SPILLCON 2013

Last week I reported on ISCO Corporate Members who will be at Spillcon 2013 - Braemar Howells Ltd., Chatoyer Environmental, Desmi Ro-Clean, Fast Engineering Ltd., Lamor Corp., Maritim Miljo-Beredskap AS, and Swire Environmental Services – but inadvertently omitted to mention Vikoma International. Apologies for this omission.

David Usher has told me that ISCO Member, The Marine Response Alliance will not have a stand *per se* but MRA member, Titan Salvage, will be there, and MRA and ISCO member, Marine Pollution Control will be represented..

I have just heard that Dr Merv Fingas, ISCO Member of Council for Canada will be attending Spillcon. I also have a confirmation that John Wardrop, Member of ISCO Council for Australia will be present and hopefully many other ISCO members in Australia and from other countries will be there. I'd be grateful if ISCO members who are planning to attend Spillcon would let me know.

NEXT DEADLINE FOR PROFESSIONAL RECOGNITION APPLICATIONS

Please note that the submission deadline for the next tranche of applications to be assessed by the Membership Standards Committee is 28 February 2013.

Remember that, because original signatures are required on documents, completed applications have to be submitted by post to the ISCO Secretariat at Balbithan House, Kintore, Inverurie, Aberdeenshire AB51 0UQ, UK.

In order to protect the value of awards, the assessment process is very thorough and the completion of your application needs to be done carefully. Incomplete submissions will be rejected and the assessment fee must be prepaid before applications can be considered.

Please ensure that your submission is complete before posting and carefully follow all the instructions on the application form. To get more information on Professional Recognition and download the Application Form, go to <http://www.spillcontrol.org>, click on "Membership" and select "Professional".

Announcement of new awards will be given in the ISCO Newsletter at the beginning of March, 2013.

ISSUE OF CERTIFICATES OF PROFESSIONAL RECOGNITION

The design work on the new certificates is taking rather longer than expected. We apologise to recipients of awards for the delay in sending out the new certificates.

We believe the new certificates will be very special and prestigious – something you will be proud to frame and hang on the wall. ISCO President, David Usher, is taking a strong personal interest and has commissioned the same designer that he uses to produce the record sleeves for his company, Red Anchor Productions. [How many of you knew that amongst his many talents and a lifetime experience in marine pollution control Dave is a renowned jazz aficionado, long-time friend of the late Dizzy Gillespie, and a much respected record producer].

Cormack's Column



In this issue of the ISCO Newsletter we are printing No. 111 in a series of articles contributed by Dr Douglas Cormack.

Dr Douglas Cormack is an Honorary Fellow of ISCO. As the former Chief Scientist at the British Government's Marine Pollution Control Unit and head of the UK's first government agency, the Warren Spring Laboratory, Douglas is a well known and highly respected figure in the spill response community. He is the Chairman and a founder member of the [International Spill Accreditation Association](http://www.international-spill-accreditation-association.org)

CHAPTER 111: KNOWLEDGE OF THE SEA EMPRESS INCIDENT

The oil recovered from water surfaces at the *Sea Empress Incident* is reported to have been 2,000 tonnes after-emulsion breaking and water-decanting at the Texaco Refinery. With some adverse weather interruption, this recovery had been achieved from 15 February to 7 March by two Pollcat inshore skimmers operating within the Haven before joining the Egmopol inshore skimmers operating further east on the Pembrokeshire south coast off Tenby in association with six sea-going recovery vessels of which two were from France and two from The Netherlands and with some 20 smaller craft not all of which were equipped for recovery, six local fishing boats, for example, being employed in towing boom-corralled pollutant from shallow water out to the sea-going recovery vessels.

As to allocating unit contributions to the above total, it was reported that one Pollcat skimmer, *Seamop*, a zero relative velocity

rope-mop skimmer with a swath width of 1.5 metres, was filled to its 45m³ capacity by 02.25 hours on 16 February, while the other,

Seasweep, fitted with a 5 metre sweeping boom and associated Lori weir-skimmer was thus filled in about the same time; and that a 25 knot Seatruck was used to locate and direct them to the most continuous pollutant layers, by which means, 1,275 m³ of oil was recovered in the following 10 days, the operational down-time of the Harbour Authority skimmers being further reduced by their discharge to a support barge for subsequent discharge to the Texaco refinery.

As to shoreline operation beyond the Haven, it was reported that some of the pollutant recovered off Tenby had been washed from the beaches by local authority personnel for recovery by the small harbour skimmers sailed from the Haven to these more exposed shorelines; and that the combined Pollcat/Egmopol operation collected another 230 tonnes of oil which one of the Pollcats transported as unbroken emulsion and co-collected free water to the seagoing recovery vessel *Forth Explorer* thus contributing to the 600 tonnes of oil attributed to this last week's inshore/seagoing recovery operation after emulsion-breaking and free water separation at the Texaco refinery. Incidentally, the Egmopol catamarans collected emulsion and free water, by means of a series of parallel troughs mounted across an endless/inclined belt between two rollers, the troughs collecting in rising through the floating layer on rounding the submerged bottom roller and discharging to reception on inverting over the top roller. Thus, with the earlier Haven recovery of 1,275 tonnes of oil, the total water-surface recovery by inshore skimmers amounted to 1,605 tonnes of the overall total of 2,000 tonnes, thus leaving only 395 tonnes (20%) to have been recovered by the six seagoing recovery craft.

Thus, with dispersants accounting for 5,515 tonnes of oil as emulsion (article 110), with mechanical recovery from water surfaces accounting for 2,000 tonnes of oil, and with 3000 -5,000 tonnes reported as having been recovered from beaches, we see that more oil was dispersed than was recovered from shore while less was recovered from water surfaces than reached shore; and that with only 7,515 tonnes of oil having been accounted for prior to stranding, and only 3,000 - 5,000m³ after stranding, we must now consider what happened to the balance of the 72,000m³ (tonnes) estimated to have been released.

1 The *Rational Trinity: Imagination, Belief and Knowledge*, D.Cormack, Bright Pen 2010 available at www.authorsonline.co.uk

2 *Response to Oil and Chemical Marine Pollution*, D. Cormack, Applied Science Publishers, 1983.

3 *Response to Marine Oil Pollution - Review and Assessment*, Douglas Cormack, Kluwer Academic Publishers, 1999.

Special feature - Inland spills

RESPONSE TO INLAND OIL SPILLS – PART 6



A short series of articles contributed by Mark Francis of Oil Spill Solutions.

Mark Francis has been involved with the oil industry since 1975. He attended his first oil spill in 1976, the Tanker Elaine V incident. He became head of response for inland spills within the UK for British Petroleum E & P in 1980 for 10 years responding to well, storage tank and pipeline spills throughout the UK. Over the next 20 years he continued to build his international operations experience and has also specialised in spill response training, delivering IMO and other courses in more than 20 countries. Mark's website is at <http://www.oilspillsolutions.org>

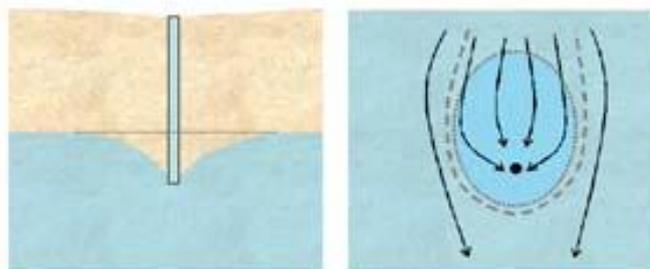
Groundwater flow

Since the recovery of free oil means modifying the normal flow pattern, some understanding of the way groundwater moves is necessary.

In the majority of cases, groundwater moves under the influence of gravity, but the rate at which it moves may vary enormously, e.g. from meters per day to meters per year, dependent on the permeability of the aquifer and any gradient.

Below is a guide in meters per annum (mpa) or meters per day (mpd):

- Dune sand 4-5 mpa
- Fine sand 16 mpa
- Medium sand 65 mpa
- Gravelly sand 250 mpa
- Fine gravel 1650 mpa or 5 mpd
- Alluvia 1-10 mpd



Special feature - Inland spills (continued)

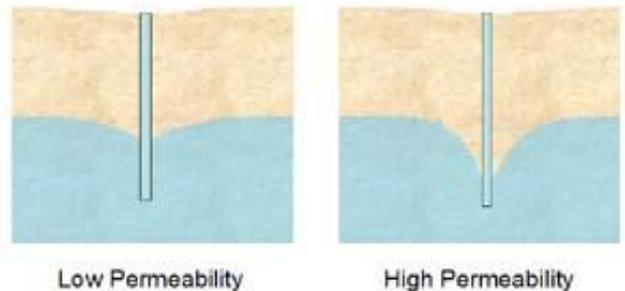
In practice, the direction and shape of the natural flow pattern in an aquifer is modified by the presence of water extraction wells. When pumping from a well, an equilibrium is eventually reached between the outflow of water from the well and the inflow from the aquifer. The water table surface becomes conical in shape, the axis of which is the well.

This is known as the cone of depression, the distance up to the surface of the water table is influenced by the well which is being pumped is known as the radius of influence. All fluid in this zone will tend to migrate to the well.

Natural flow can therefore be considerably disturbed by man. When pumping takes place the water table may be lowered and it is possible to reverse the flow. This is a common phenomenon where water extraction takes place.

The size of the cone of depression will depend on the permeability of the surrounding rock, as shown the lower permeability the wider the cone.

When pollution occurs in such areas careful hydrogeological monitoring is necessary to minimise its effects.



Measuring groundwater velocity

When oil has or is thought to have contaminated the groundwater it is very important to know in which direction and at what velocity the oil is being transported, particularly when drinking water wells are present in the area.

A reliable picture of the flow patterns can be obtained from a series of measurements:

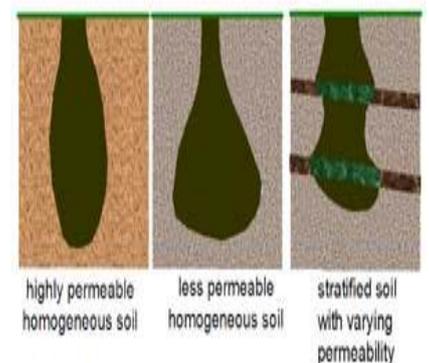
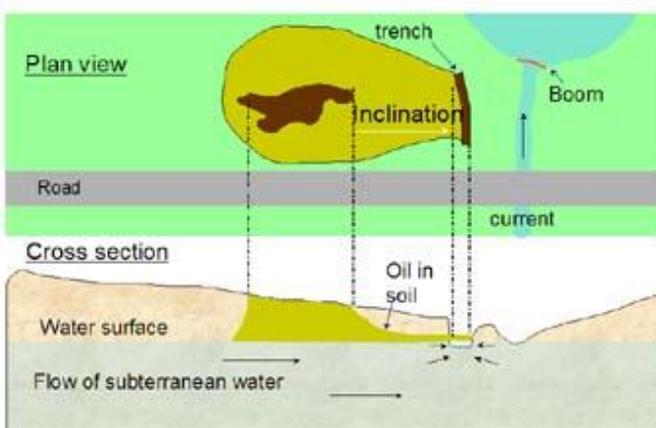
1. Observing the level of water a number of observation wells and the production of producing wells. Usually observation wells are not present and have to be drilled for this purpose. From the levels contour lines for the depth of the water table may be mapped. Making use of the measured well capacities, local flow velocities can be derived.
2. Observing tracer breakthrough times to a number of wells. Various materials such as dyes, salts, etc. may be used as tracers.
3. Observing the rate of dilution of a tracer in a well as a result of the underground flow. This relatively simple and quick experiment provides the velocity and direction of the flow.

This data may be used to add to mathematical models to predict the behaviour of the aquifer. *Remember the better the data the better the result.*

Looking at the surface relief gives us some idea of how the rocks are formed below the surface e.g. A hill will have its roots below the surface and so the water will flow around the hill. How far out from the bottom of the hill can only be found out by drilling a series of boreholes. Having found the water we also have to know in what direction it is flowing.

Migration through the retention zone

The degree of penetration is a function of ground structure as well as the type of product involved. A product with low viscosity will penetrate more rapidly than one with a high viscosity. In homogeneous ground, without stratification or marked variations in pore size, the front of the penetrating product tends to be pear shaped, with the bulbous part at the bottom. The vertical penetration is due to gravity while the horizontal is due to capillary action. In permeable stratum the penetration is mainly vertical whereas in less permeable stratum it is more horizontal. The heterogeneity of the subsoil has a considerable influence on the shape of the penetrating body.



In some places the water table is very close to the surface. In this case trenches can be excavated in front and downhill of the incident when water enters the trench the oil will arrive on its surface allowing skimmers or absorbents to be used for its recovery. All of these incidents take a long time to complete, and

Special feature - Inland spills (continued)

can be very costly. The speed of the operation depends on the porosity of the substrate and the speed of the water flow.

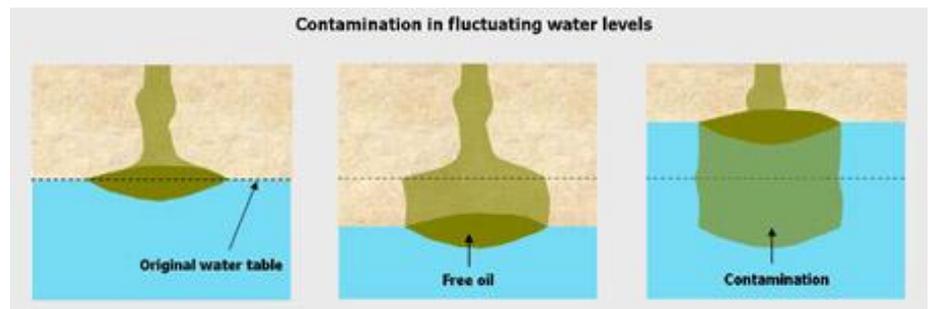
Migration on the water table

When free oil reaches the capillary fringe and if the volume is large enough, it first forms a layer of increasing thickness under the influence of the further descending oil. This exerts pressure depressing the water surface. Gravity acts to restore the initial level and causes a pancake which moves laterally in the direction of the flow.

During the migration some oil clings to the grains of rock due to capillary action.

Two important considerations may lead to inaccurate estimations of oil present on the water table:

1. Repeated water table fluctuations expose the oil to soil which had not previously been contaminated. Each contact retains part of the volume of free oil and the effect is a reduction of the volume of free oil.
2. Fluctuations in fractured rock may increase the apparent volume by a washing out process of pockets of trapped oil.
3. The thickness of oil spread out over the water table is not as thick as that measured in the wells.



To be continued

Special feature – In situ burning

IN SITU BURNING: CHAPTER 3



A short series of articles on In Situ Burning contributed by Dr Merv Fingas of Spill Science, Edmonton, Alberta, Canada T6W 1J6 fingasmerv@shaw.ca

Merv Fingas MSc PhD worked for more than 35 years in the field of oil spill technology at Environment Canada's Environmental Technology Center in Ottawa, Ontario. As head of the Emergencies Science Division at the Centre, he conducted and managed research and development projects. He is currently working independently in Alberta. Dr Fingas is the Member of ISCO Council for Canada.

Summary of the Serial

This is the third of a series of articles on in-situ burning of oil spills. This series will cover in-situ burning step-by-step and will present the latest in knowledge on the topic.

3 The Science of Burning (*Continued*)

Studies conducted in the last ten years have shown that the type of oil is relatively unimportant in determining how an oil ignites and burns, except for heavier or emulsified oils. However, heavy oils require longer heating times and a hotter flame to ignite than lighter oils and may often require a primer such as kerosene or diesel fuel. Earlier studies appeared to indicate that heavier oils and oils with water content required greater thicknesses to ignite, however, recent testing has shown this to be incorrect.¹¹ Several workers have tested various oils to determine their ignitability with the general result that most oils are similar unless stable emulsion formation had occurred.¹³

Burn efficiency is the initial volume of oil before burning, less the volume remaining as residue, divided by the initial volume of the oil. The amount of soot produced is usually ignored in calculating burn efficiency. Efficiency is largely a function of oil thickness. For example, a slick of 2 mm burning down to 1 mm yields a maximum efficiency of 50%. A pool of oil 20 mm thick burns to approximately 1 mm, yielding an efficiency of about 95%. Current research has shown that other factors such as oil type and low water content only marginally affect efficiency.

Most, if not all, oils will burn on water if slicks are thick enough and if sufficient vapors can be produced by the ignition and subsequent fire. Except for light refined products, different types of oils have not shown significant differences in burning behavior. Weathered oil requires a longer ignition time and somewhat higher ignition temperature.¹⁴ Alternatively weathered or heavy oils can

be ignited with the addition of a primer.¹¹ At the time of the *Torrey Canyon* spill (1967), it was not known that the thickness of the oil would be a limitation. Several workers conducted studies shortly after this incident and concluded that the slicks that did not ignite were below minimum thickness.¹ Twardus conducted preliminary tests of minimum burning thicknesses and proposed that all fuels burned at the 5 mm initial thickness tried.¹⁴ Bunker C required longer heating times and the addition of a primer. Further testing on light crudes showed that the minimum thickness for ignition was 0.58 to 0.62 mm and the residues varied between 0.35 and 0.58 mm.¹⁵ This was compared to unconfined fresh oil thicknesses of 0.5 to 0.6 mm at 0°C, 0.2 to 0.25 mm at 5°C, and 0.5 mm at 10°C. Aged oil showed limiting spreading thicknesses of 1.90 to 3.0 mm at 0°C, 1.2 to 2 mm at 5°C, and 1.2 to 1.3 mm at 10°C. Fingas et al. showed that thicknesses greater than about 0.5 mm burned for all types tested.^{16,17} Overall, many workers have concluded that the rule-of-thumb is that the minimum ignitable thickness of oil is 1 to 3 mm, however most did not test thin layers nor establish minimums. Fingas showed that even heavy oils at thicknesses of 0.5 mm and above could be ignited, sometimes with the aid of diesel as a primer.¹¹ Some studies have been conducted of the final thickness of burning oil on water before it is extinguished. Buist et al. reviewed a large number of cases in which oil burn residue, or the thickness of the oil at the end of the burn, was measured.³ They found that the average final thickness was 1 mm and the residue ranged in thickness from about 0.5 to 2 mm. Thus, it was proposed that 1 mm be adopted as the rule-of-thumb for final burn thickness. **So in summary, there is no single limit of thickness to burning. For efficient burning the starting oil should be simply a few millimeters.**



Figure 2 An operations crew monitors a small burn during the Deepwater Horizon incident (Photo courtesy of Applied Fabric Technology Inc.).

It was uncertain whether oil that is completely emulsified with water can be ignited. Oil containing some emulsion was ignited and burned.¹ During the successful test burn of the *Exxon Valdez* oil, some patches of emulsion were present (probably less than 20%). While it did take longer to ignite the burn (>5 minutes), it did not affect the efficiency of the burn.¹⁸ It is suspected that fire breaks down unstable water-in-oil emulsion, and thus water content may not be a problem if the fire can be started. There is no evidence that the water is a specific factor at which emulsions can still be ignited. One test suggested that a heavier crude would not burn with about 10% water, another oil burned with as much as 50% water, and still another burned with about 70% water.¹³ Twardus noted that mixtures containing less than 20% water ignited readily but required pre-heating.¹⁴ Mixtures of oil with 30 to 50% water required a powerful igniter

and a still longer pre-heating time. Three mixtures containing about 70% water burned with a long pre-heating time and a powerful igniter. One study indicated that emulsions may burn if a sufficient area is ignited.¹⁹ Further studies indicated that stable emulsions will not burn but oil containing less than 25% water can be ignited. The burning of emulsions is probably related to their stability class.²⁰ It should be noted that the emulsion stability was not measured in any of the previous studies. Emulsions may not be a problem because chemical de-emulsifiers could be used to break enough of the emulsion to allow the fire to start. Once started, it is believed that most emulsions would burn. This certainly was the case at the Deepwater Horizon spill where some or most of the oil was emulsified, but burned well.²¹ Figure 2 shows another burn from the Deepwater Horizon spill.

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To be continued

Publications

FOR YOUR INTEREST – LINKS FOR RECENT ISSUES OF PERIODICALS

Bow Wave	News and views on marine trade, insurance and risk	January 13 issue
UK Spill News	January Member News & notice of AGM	January 2013 issue
Essential Hazmat News	Alliance of Hazardous Materials Professionals	January 14 issue
The Catalyst	Newsletter of JOIFF (Hazard Management & Fire-fighting)	January 2013 issue
CROIERG News	Canberra & Regions Emergency Response Group	January 2013 issue
Environmental Expert	Soil and groundwater news	January 24 issue

USA: DOT LAUNCHES FREE APP FEATURING EMERGENCY RESPONSE GUIDEBOOK

January 18 - The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) today announced a free, mobile web app of its Emergency Response Guidebook 2012 (ERG). The new safety tool will provide the nation's emergency responders with fast, easily accessible information to help them manage hazardous material incidents.

The mobile ERG will make it easier for fire-fighters, police and other emergency first responders to quickly locate the information they need, thanks to an electronic word search function, and will ensure easy reading even during night-time emergencies. The 2012 version of the ERG includes new evacuation tables for large toxic gas spills and standard response procedures for gas and liquid pipeline incidents. *PHMSA* [Read more](#)

AIR MONITORING TRAINING DVD FOR EMERGENCY RESPONDERS

This two-part series studies basic monitoring instruments and sampling procedures used in emergency response. [More info](#)

Events

SOIL & GROUNDWATER EVENTS UPDATE COMPILED BY ENVIRONMENTAL EXPERT

Upcoming soil and groundwater events in USA, UK, Spain and Romania. [More info](#)

UK SPILL AGM AND DINNER

The Annual Meeting will be held at 1800hrs on Tuesday 5th February 2013, at Watermens Hall, in London.

All members are invited to this Meeting - please note that only eligible Corporate members can vote on Association matters. The current Chairman Glyn Humphries will be handing over to Jon Burton of RAW Group, as new Chairman for 2013-2015, with Andrew Nash of Desmi appointed as Vice Chairman.

The Annual meeting will be followed by the Annual Dinner, price £60 per person, guests are invited, and Mick Borwell, Environment Issues Director of Oil & Gas UK will be speaking. [More info](#)

UK: INTERNATIONAL PETROLEUM WEEK

Meeting today's challenges | Investing in tomorrow's opportunities : 18 - 20 February 2013, Park Plaza, Victoria, London

International Petroleum Week (IP Week) is the leading thought-leadership forum for the international oil and gas community, attracting over 2,000 key influencers and senior decision-makers from around the world every year. [More info](#)

Company news

NEW ADDRESS FOR UK SPILL ASSOCIATION

The new address is 78 Moriconium Quay, Poole, BH15 4QP

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