



# ISCO NEWSLETTER

The Newsletter of the International Spill Response Community

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## International news

### STRICTER EUROPEAN LEGISLATION IMPOSED FOR OFFSHORE DRILLING

February 22 - The European Parliament and the Member States have reached an agreement on a new European Directive that ensures the safety of offshore oil and gas drilling.

Ivo Belet MEP is responsible on behalf of the European Parliament for the new legislation that imposes financial requirements and strict authorisation procedures on operators.

Ivo Belet said: "Europe has learned its lessons from the Deepwater Horizon catastrophe and wants to reduce the risks of drilling at sea to a minimum. Especially now that several Member States with little experience are exploring new drilling operations at sea, there is an urgent need for a strong legislative framework. The previous guideline is nearly twenty years old and focuses insufficiently on safety."

The main innovations of this Directive are:

**Liability and financial guarantees:** Oil and gas companies are fully liable for any form of environmental damage. They must prove that they have sufficient financial capacity to cover the consequences of a possible incident.

**Mandatory risk assessment and emergency response plans:** Prior to starting up any drilling activity, operators must complete a risk analysis and prepare an emergency response plan, which must be tested regularly. Coordination with neighbouring countries is required if cross-border effects can be expected. The materials needed to carry out the emergency response plan need to be available at all times.

## International news (continued)

**Stricter licensing procedure:** Drilling at sea can only start after approval by an independent national authority.

**Europe sets the tone:** Companies operating in EU waters must now demonstrate that their risk prevention policy also applies to operations outside the EU.

**Involvement of the population:** All Member States are now legally obliged to closely involve the local population even before exploratory drilling is carried out.

**Greater role for EMSA:** The expertise of the European Maritime Agency should be used if a gas or oil leak occurs. EMSA must inspect the emergency response plans.

**Arctic:** Since the EU has no waters in the Arctic, it makes no sense to call for a moratorium on drilling in this area. Therefore, it was agreed that within the Arctic Council the highest safety standards for oil drilling must be promoted. As regards remote areas and areas where access is difficult, the feasibility emergency response plans must be tested in all weather conditions.

*The Maritime Executive* [Read more](#)

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## LEADING PREPAREDNESS FOR AN INTERNATIONAL OIL SPILL RESPONSE IN THE ARCTIC



### Excerpt from an article by Capt Peter Troedssen in the Fletcher Forum of World Affairs

February 20 - Imagine an oil spill on the scale of the Deepwater Horizon...in the Arctic. Unlike it has in the Gulf of Mexico, the U.S. has yet to develop the capabilities and local expertise to properly respond to an oil spill in the harsh Arctic environment. The [joint Mexico-US \(MEXUS\) plan](#), that regulates activities in the Gulf of Mexico, is intended to “prevent, control, mitigate or eliminate the threat of an incident, to minimize adverse effects to the marine environment, and to protect public health and welfare.” As America’s Arctic backyard rapidly opens, with increased accessibility to valuable natural resources and newly navigable transit routes, it’s more essential than ever that we develop a

comparable oil spill response strategy for the Arctic.

Convincing U.S. policymakers to invest in our Arctic capabilities will be difficult in today’s grim fiscal environment, where federal budgets are already stretched thin. But scarce resources demand greater scrutiny of their allocation, and greater reliance on inter-agency and international partnerships.

Our Canadian and Mexican neighbors have worked with us for years to ensure oil spill preparedness in the lower Alaskan and Canadian latitudes and in the Gulf of Mexico. Bilateral agreements with both Canada and Mexico outline joint response systems and identify agencies from each country that will provide support in carrying out the objectives of the plans. Biennial exercises with our neighbors involve scenarios with major oil spills that threaten the coastal areas of the participating nations. Although all parties work hard to prevent such calamities, readiness to respond is vital. But bilateral agreements and training regimes are only a small part of the equation for preparedness in the Arctic. In the Gulf of Mexico, the offshore oil and gas industry has been growing and evolving for decades. As a result, an advanced level of intermodal transportation and support infrastructure, including spill response and clean-up industries, is in place. In contrast, oil spill exercises in lower Alaskan and Canadian latitudes have consistently demonstrated the lack of infrastructure which cripples response efforts.

This lack is exacerbated by a remote and harsh operating environment. Find Kaktovik, Alaska on a map and take note of the road system, or the next nearest town. Transportation of personnel and equipment, berthing, food, water, shelter, decontamination, and communications capabilities in these remote areas would be a monumental challenge for a large scale response operation. Port facilities in the area can accommodate only shallow draft vessels, and airfields have only short, gravel runways. A lack of road systems and a complete dearth of hotels for lodging and staging capability complete the picture. A significant investment in infrastructure is needed. *Fletcher Forum of World Affairs* [Read the complete article by Capt. Peter Troedssen](#)

## USA: BARGE COLLISION RESULTS IN ANOTHER OIL SPILL ON THE MISSISSIPPI

February 19 - The Coast Guard is responding to a report of an oil discharge on the Mississippi River near the Interstate 10 bridge in Baton Rouge, Monday.

Watchstanders at Coast Guard Sector New Orleans received notification Thursday at 8:53 p.m. from the National Response Center reporting at approximately 7:50 p.m. two barges were at a transfer station near the bridge on the Mississippi River. The barges were stationary while discharging fuel to the facility. While transiting the area, a third barge struck one of the stationary barges, knocking a transfer connection hose loose and into the water.

Operations were quickly secured following the incident and Coast Guard Marine Safety Unit Baton Rouge, along with members from OMI Environmental Services and Louisiana Oil Spill Coordinator's Office, were on scene to respond.



Blessey Marine Services has assumed responsibility for the spill and has contracted OMI Environmental Solutions as the oil spill response organization. Sixteen-hundred feet of 18-inch hard boom have been deployed to contain the spill. *The Maritime Executive* [Read more](#)

## BAHAMAS: OIL SPILL REPORTED OFF PINDER'S POINT, GRAND BAHAMA

February 24 - On Saturday, 16th February, 2013 at approximately 1:15 p.m., officials from BORCO reported that an oil spill had occurred in the vicinity of Pinder's Point, Grand Bahama. In response to the spill a team comprising officials from BORCO, the Port Department and the Department of Environmental Health Services immediately mobilized to commence clean-up operations and assess the extent of the oil spill. *The Bahamas Weekly* [Read more](#)

## USA: CLEANUP CONTINUES AT OIL SPILL SITE IN JASPER COUNTY



Workers from several environmental cleanup companies Complete Environmental and United States Environmental Services removed oil Thursday from Piney Branch Creek just east of Airport Road on N. Pine Avenue just outside Bay Springs. / Rick Guy/The Clarion-Ledger

February 7 - Some 1,260 gallons of crude oil spewed into a creek outside Bay Springs on Tuesday, 30 times more than originally estimated but a fraction of what some say could be the final tally.

An official close to the cleanup effort but who was not authorized to speak on the record said at least 300 to 400 barrels spilled into the Piney Branch Creek. That's between 12,600 and 16,800 gallons — a drastic increase from the 40 gallons initially reported by Plains All American Pipeline, the Houston, Texas-based company that owns the pipeline. *Hattiesburg American* [Read more](#) [Thanks to Don Johnston of ISCO Industry Partner, DG & Hazmat Group]

## USA: CHEMICAL TANKERS COLLIDE OFF GALVESTON



February 20 - Two chemical tankers inbound toward Houston collided in the early morning on Wednesday, approximately 70 miles south of Galveston according to a report by the US Coast Guard.

At approximately 4:30 a.m. watchstanders at Coast Guard Sector Houston/Galveston were notified of the incident involving the Chem Sea, a 385-foot, Marshall Islands-flagged tanker, and the Bow Kiso, a 557-foot, Panamanian-flagged tanker.

*gCaptain* [Read more](#)

## Incident reports (continued)

### JAPAN: RUSSIAN OIL TANKER STRANDED IN SEA OF JAPAN

February 19 - A Russian tanker carrying almost 800 tons of fuel oil became stranded in the Sea of Japan after suffering an engine failure, the Emergencies Ministry reported on Sunday, February 17, according to RIA Novosti.

"The tanker Marine Alliance, which was sailing to the [Russian Pacific] port of Nakhodka, has been disabled due to a failure of its main engine," the Emergencies Ministry said in a statement, without specifying weather conditions at the scene of the incident. The tanker's 20-member crew did not suffer in the incident. The tanker is expected to be taken on tow by another Russian vessel, Georgiy Froier, which is sailing towards the site of the incident, the statement said. *BSR Russia* [Read more](#)

### PHILIPPINE COAST GUARD CONTINUES TO MONITOR OIL SPILL IN BOLINAO



February 21 - The Philippine Coast Guard ended its search and rescue efforts for the missing 14 missing crewmen of a Panamanian-flagged cargo vessel that sank in the waters off Bolinao in Pangasinan on February 17.

At the moment, the PCG is closely monitoring the movement of the oil spill at the sea off Bolinao. "Its distance as of yesterday was 10 to 12 nautical miles on the northwest direction. It was on its way out of the West Philippine Sea", Gonzales said.

He said the rough sea condition makes it difficult for them to contain the oil spill. "I think it is best that we let nature do the rest and let it evaporate", Gonzales added. The oil spill measured three nautical miles and was spotted at the site where the vessel sank. *The Maritime Executive* [Read more](#)

### UK: POLLUTION THAT KILLED SEABIRDS CANNOT BE TRACED, RULES INVESTIGATION

*Picture: A seabird being cleaned up by rescuers after being found covered in a life-threatening sticky substance. Photograph: RSPCA/PA*

February 19 - The source of the [pollution](#) that killed hundreds of seabirds off the UK coast may never be known after the maritime and coastguard agency said it had wound up its investigation.

A major rescue operation was launched after [birds](#), mainly guillemots, washed up along south coast beaches earlier this month, [coated in a sticky substance](#).

The substance was eventually identified as PIB – polyisobutene – which is used in products ranging from adhesives to sealants and even chewing gum. *The Guardian* [Read more](#)



## Other news

### UK: BP TO FUND EMERGENCY SUPPORT BOAT FOR NORTH SEA

February 19 - BP is to bankroll a boat to provide emergency tug cover for major incidents in the waters around the Northern Isles.

- Vessel will provide support in case of emergency incidents
- Currently only one support boat - the Herakles - which is stationed on Orkney
- Emergency cover had first been provided in the wake of the Braer oil spill in 1993

In a groundbreaking deal, the oil major has agreed to allow the Coastguard to call on a BP-chartered vessel to provide support in the event of a pollution incident.

The Grampian Frontier will provide back-up for the UK's only remaining dedicated emergency tug, the Herakles, which is already stationed on Orkney. A government spokesman said: "The vessel's owner, North Star Shipping, is working with the Maritime and Coastguard Agency [MCA] to ensure that the crew and equipment are able to respond. *The Scotsman* [Read more](#)

## **CHINA SAYS CONOCOPHILLIPS CAN RESUME PRODUCTION**

February 23 - A Chinese regulator says the Chinese subsidiary of ConocoPhillips can resume operations at an oilfield that was closed in 2011 after two oil spills.

The State Oceanic Administration said in a statement Saturday that conditions at the Penglai 19-3 oilfield had returned to normal after a series of rectification measures. It says ConocoPhillips can gradually resume production there.

The oilfield off northeastern China is jointly owned by ConocoPhillips' Chinese subsidiary and China National Offshore Oil Corp., China's main offshore oil and gas producer. *The Houston Chronicle* [Read more](#)

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## **USA: APACHE CORP. AVOIDS BLOWOUT IN WELL OFF VENICE; EVACUATES 15 WORKERS AS A PRECAUTION**

February 15 - A natural gas exploration well being drilled by the Apache Corp. in shallow Gulf waters about 50 miles east of Venice avoided a blowout on Feb. 5 by the successful operation of the well's blowout preventers, the company reported this week. The incident forced the evacuation of 15 non-essential workers from the 65-worker rig. *The Times Picayune* [Read more](#)

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## **USA: BP TO FIGHT GOVERNMENT'S 'EXCESSIVE' DEMANDS OVER DEEPWATER OIL SPILL**

February 19 - [BP](#) has announced that it will square off against the federal government in court next week to fight "excessive" claims arising from the 2010 Gulf of Mexico oil disaster.

[In a combative statement](#), the oil giant said it had been open to a settlement in the civil trial, set to start on Monday in a federal court in New Orleans. But it had failed to reach a deal with federal government lawyers.

The trial could potentially result in \$21bn (£13.6bn) in civil damages for BP, but the company said on Tuesday it would rather take its chances in court than continue negotiations with federal government lawyers. *The Guardian* [Read more](#)

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## **CANADA: TRANSPORT CANADA PROPOSES CHANGES TO DG TRANSPORT REGULATIONS**

Transport Canada has recently emitted 2 propositions for regulatory modification to the Clear Language transport of dangerous goods regulations (TDGR). The first, concerning primarily an update to the regulations as of international standards is, for the moment, only a proposal. It is available for consultation and comments but should take a while before being approved.

On the other hand, the second, concerning marking, labeling and placarding, is in the final phase of approval. The proposition published in part I of the Canada Gazette, can be consulted until February 14th 2013. Once this date has passed, Transport Canada will make the final corrections to this modification and publish it in part II of the Canada Gazette and the proposition will come into effect. [Thanks to pcjr of Hazmat 101 Group] [More info](#)

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## **BRAZIL: CHEVRON, TRANSOCEAN SAY BRAZIL HAS DROPPED CRIMINAL CHARGES FROM FRADE OIL SPILL**

February 20 - A Brazilian judge dropped criminal charges against Chevron Corp, Transocean Ltd and 17 of their employees related to a November 2011 offshore oil spill, the companies said on Wednesday.

The criminal case, and a civil suit seeking as much as 40 billion reais (\$20.4 billion) in damages, have cast a chill over Brazil's oil industry.

The criminal suit carried penalties of up to 31 years. The still-open civil case is Brazil's largest-ever environmental lawsuit, even though the amount of oil spilled was much less than other recent spills in Brazil and abroad. *gCaptain* [Read more](#)

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## **GHANA: EPA: DEMAND REMOVAL OF ALL ABANDONED UNDERGROUND FUEL TANKS IN GHANA**

February 15 - Recently, when what was said to be a new oil discovery turned out to be leaked oil from an underground fuel tank in an abandoned petrol filling-station, not many cottoned on to the fact that an environmental disaster had struck people in the area surrounding that defunct petrol filling station – amidst the excitement the rumour generated across Ghana. *Vibe Ghana* [Read more](#)

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## Other news (continued)

### AUSTRALIA: AMOSC OPENS NEW OFFICE IN PERTH

AMOSC is delighted to announce the opening of a Perth based office at Koolinda House Fremantle at the start of 2013. This is being done for the benefit of our Perth and WA based members and also to facilitate onsite advice and assistance in the WA region. We will also be conducting Perth based training in the near term.

We welcome onboard 2 new staff members for the Perth office. Woody Leef will lead the office; Woody comes from a Naval Aviation and ship driving background and has had recent spill experience with the Rena incident. Nathan Young comes to us from OSRL Southampton and brings with him a wealth of experience in spill preparedness and response. Nathan has worked with OSRL for a number of years within operations and consultancy. Nathan has attended spills in and around the UK, Africa, Europe and the USA. AMOSC [Read more](#)

## People in the news

### REMPEC: FAREWELL TO CAPTAIN JOSEPH ZERAFA AND MR ALBERT BERGONZO



Captain Joseph Zerafa, SafeMed Project Officer (Maritime Safety) and Mr. Albert Bergonzo, SafeMed Project Officer, Maritime Administration, who joined REMPEC in 2006, left the Centre after seven years of exceptional service. Captain Zerafa and Mr Bergonzo, who were responsible, under the direction of the Director and the Senior Programme Officer, for the implementation of the SafeMed I and II Projects, terminated their contracts at the end of 2012 when the implementation phase of the SafeMed II Project ended.

During a staff farewell lunch, Mr Frederic Hebert, Director of REMPEC, paid tribute to Captain Zerafa and Mr Bergonzo's exceptional service to the Centre and presented them with the crest of REMPEC and with a small memento. All the staff members at REMPEC wished them success and happiness for their future.

## ISCO News

### THANK YOU FOR PAYING YOUR ISCO SUBSCRIPTION

Grateful thanks to all of you who responded to the reminder in last week's newsletter and brought their subscriptions up-to-date.

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### MESSAGE FROM ISCO MEMBER

Dear Esteemed Members of ISCO,

Kaku Professional Engineers Limited, Nigeria in collaboration with Texas A & M University National Spill Control School, Corpus Christi, Texas, USA cordially invites all the members of ISCO to attend our 2nd Oil Spill Conference holding in Accra, Ghana in June 12-14, 2013 to deliberate interactively and holistically on how to solve myriads of oil spill problems that have led to severe environmental degradation with its concomitant destruction of land, fishing industry, marine life and threat to safety and health of the people living in the oil producing areas of Nigeria.

We call on international response and control organisations to assist through this conference with ideas and strategies to prevent, clean-up and restore the environment of the affected areas of Nigeria. Apart from security challenges, we moved this Conference to Ghana to enable us share experiences with our Ghana neighbour that just discovered oil and to reach wider audience.

Please for further information and registration, visit our website <http://www.oilspillconferenceng.com>

Kind regards,

Engr. Sylvester Egwu



In this issue of the ISCO Newsletter we are printing No. 115 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](#)

### CHAPTER 115: KNOWLEDGE OF THE SEA EMPRESS INCIDENT

Having previously estimated the amount of stranded oil at the *Sea Empress Incident* from evaporative loss and viscosity controlled half-life of the emulsified non-volatiles, I now compare my estimates with what can be gleaned from official reports as to how much actually stranded.

Thus, the SEEEC Report states that between 5,000 and 15,000 tonnes of oil and/or emulsion stranded over more than 200 miles of coastline, the information provided for individual locations being sparse. However, this report does state that pollutants began to come ashore on the evening of the initial grounding and on the following day in large quantities at West Angle and Angle Bays and at Freshwater West, while several beaches within the Haven were polluted over the following days; that from 21 - 26 February, small patches stranded from St Anne's Head to Skommer Island and along the south Pembrokeshire coast where they came ashore at Stackpole and Manorbier in amounts up to 700 tonnes of emulsion on 24 February, at Pendine Sands in amounts up to 1,000 tonnes on 24 - 26 February and at Lydstep on 26 February; and that the most significant day was 27 February when some 70% of the total came ashore from Tenby to Marros, suggesting a total of 5,800 tonnes of emulsion for Carmarthen Bay shores as a whole. Again, the MPCU Report adds somewhat to the above details in agreeing the total emulsions to have been from 10,000 to 15,000 tonnes. As to the fuel oil, however, the SEEEC Report suggests the estimated 360 tonnes to have comprised releases in the period 15 - 21 February of which the most significant was on the evening of the 21<sup>st</sup> and smaller releases at the discharge jetty with others occurring on the tow to Belfast. Again, this Report refers to the appearance of fuel oil in an arc offshore between Amroth and Saundersfoot within Carmarthen Bay, and even to some tens of tonnes of oil pellets on the southeast coast of Ireland, though it reports no attempt to attribute these to the *Sea Empress*, while the MPCU Report simply repeats the total release as being 360 tonnes.

Now with reference to the Table in article 112 we see that with 40% evaporative loss and a 36 hour half-life, the amount of emulsion coming ashore in the first 3 days of onshore wind would have been 53,527 tonnes had sufficient oil been released in that period and the amount coming ashore in the six day period of onshore winds which followed the intervening 3 day period of offshore winds would have been 6,690 tonnes to give total stranding of 60,217 tonnes of emulsion with an oil content of 20,072 tonnes which clearly did not happen because the releases were sequential and subject to differing wind/ tide vectors. However, when we recognise that only 1/5<sup>th</sup> of the total release occurred over the first 3 days to strand on average on day 1.5 and that 4/5<sup>ths</sup> of the total release remained at sea for the next 3 days to strand on average over day 3 of the subsequent 6 day period of onshore winds, we see from the Table in article 114 that 32% evaporative loss and a half-life of 36 hours permits a first stranding of 7,518 and a second of 7,203 tonnes which totals to 14,721 tonnes containing 4,907 tonnes of oil, that for 40% evaporative loss the corresponding total stranding would be 13,338 tonnes of emulsion containing 4,395 tonnes of oil; that the 270 tonnes of fuel oil may be added to either to give respective overall totals of 5,177 and 4,665 tonnes of oil; and that this seems to be in adequate agreement with the 3,000 - 5,000 tonnes of oil estimated to have stranded by direct observation, thus further vindicating the approach which I developed/extended from observations at the *Ekofisk Blow-out* and *Katina Incidents*.

However, the agreement of the amount stranded according to the forgoing analysis of the *Sea Empress Incident* with the stranded amount reported by MPCU/SEEEC (having taken account of the 2,000 tonnes of oil recovered from water surfaces and the 5,515 tonnes dispersed by dispersant) leaves little difference to be accounted for by natural dispersion/degradation from shorelines after stranding, but shows that the balance of the 72,000 tonnes released (having taken account of evaporated losses) which did disperse/degrade naturally amounted to 61,485 -59,485 tonnes depending on whether 3000 or 5000 tonnes were recovered from shorelines. However, had there been no intervention, all of the 72,000 tonnes would have been naturally dispersed to 1% (720 tonnes) in ~ 7 half-lives (10.5 days) and to 0.01% (7.2 tonnes) in another ~ 7 half-lives, i.e. to 7.2 tonnes in 3 weeks, had it remained at sea for these lengths of time without stranding as did the Ekofisk release which at a rate of 3,000-4,000 tonnes per day for 7.5 days and with an evaporation of 32% and a half-life of 12 hours had dispersed almost entirely when observation was terminated 60 hours after capping (articles 31-46).

Prior to 1996, I was already using this balance-approach to estimate the degree to which cargo/bunker transfer had reduced potential stranding in a succession of arbitration awards to salvors, during the course of which I applied it to the *Sea Empress Incident* for my own interest. I could equally well apply it to the *Deepwater Horizon Incident* should anyone be interested in further extending/refining this approach to determining the rates of natural dispersion which enhance natural rates of biodegradation, while, as to dispersant use at the *Deepwater Horizon Incident*, those who have read articles 16-30 and 47-61 already know that no enhanced dispersion could have resulted from injecting dispersants into subsurface plumes of already dispersed droplets as attempted at *Deepwater Horizon*: such action would simply have added dispersant to seawater while, for effectiveness, it must be applied to continuous oil layers of appropriate thickness, preferably for subsequent wave agitation.

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

## RESPONSE TO INLAND OIL SPILLS – PART 10



### **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>

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### **Chemical treatment technologies**

#### **Chemical precipitation**

Chemical precipitation is commonly used in wastewater treatment to remove hardness and heavy metals. In general, the process involves addition of agent to an aqueous waste stream in a stirred reaction vessel, either in batches or with steady flow. Most metals can be converted to insoluble compounds by chemical reactions between the agent and the dissolved metal ions. The insoluble compounds (precipitates) are removed by settling and/or filtering.

#### **Ion exchange**

Ion exchange for ground water remediation is virtually always carried out by passing the water downward under pressure through a fixed bed of granular medium (either cation exchange media and anion exchange media) or spherical beads. Cations are displaced by certain cations from the solutions and ions are displaced by certain anions from the solution. Ion exchange media most often used for remediation are zeolites (both natural and synthetic) and synthetic resins.

#### **Carbon absorption**

The most common activated carbon used for remediation is derived from bituminous coal. Activated carbon absorbs volatile organic compounds from ground water by chemically binding them to the carbon atoms.

#### **Chemical oxidation**

In this process, called In-Situ Chemical Oxidation or ISCO, chemical oxidants are delivered in the subsurface to destroy (converting to water and carbon dioxide or to nontoxic substances) the organic molecules. The oxidants are introduced as either liquids or gasses. Oxidants include air or oxygen, ozone, and certain liquid chemicals such as hydrogen peroxide, permanganate and persulfate. Ozone and oxygen gas can be generated on site from air and electricity and directly injected into soil and groundwater contamination. The process has the potential to oxidize and/or enhance naturally occurring aerobic degradation. Chemical oxidation has not been proven to be an effective technique for dense non-aqueous phase liquid or DNAPL when it is present.

#### **Surfactant enhanced recovery**

Surfactant enhanced recovery increases the mobility and solubility of the contaminants absorbed to the saturated soil matrix or present as dense non-aqueous phase liquid. Surfactant-enhanced recovery injects surfactants (surface-active agents that are primary ingredient in soap and detergent) into contaminated groundwater. A typical system uses an extraction pump to remove groundwater downstream from the injection point. The extracted groundwater is treated aboveground to separate the injected surfactants from the contaminants and groundwater. Once the surfactants have separated from the groundwater they are re-used. The surfactants used are non-toxic, food-grade, and biodegradable. Surfactant enhanced recovery is used most often when the groundwater is contaminated by dense non-aqueous phase liquids (DNAPLs). These dense compounds, such as trichloroethylene (TCE), sink in groundwater because they have a higher density than water. They then act as a continuous source for contaminant plumes that can stretch for miles within an aquifer. These compounds may biodegrade very slowly. They are commonly found in the vicinity of the original spill or leak where capillary forces have trapped them.

#### **Permeable reactive barriers**

Some permeable reactive barriers utilize chemical processes to achieve groundwater remediation. One particular type of permeable reactive barrier utilizes a swellable, organically-modified silica embedded in iron, which is injected in situ in order to create a permanent soft barrier in the ground. Water filters through the barrier, and the silica material absorbs toxins, such as TCE. The iron dechlorinates the solvents in the groundwater, often reducing toxicity levels below detectable limits with no toxic daughter products, no solid waste removal, and no air pollution. This type of permeable reactive barrier is also more dispersed than others.

***To be continued***



## IN SITU BURNING: CHAPTER 7



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](mailto: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 seventh 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.

### 7. The History of Burning – *The NOBE Experiment*

The Newfoundland Burn Experiment took place on the Grand Banks, east of the port of St. John's, Newfoundland. The experiment was conducted on August 12, 1993.<sup>1,30,31</sup> Two replicate experiments were carried out wherein 50 m<sup>3</sup> (13,200 gal) of oil was discharged into a fire-proof boom and ignited. A sophisticated array of state-of-the-art sensing, sampling and data-gathering equipment was deployed from a variety of platforms. Data was collected and analyzed to generate information on over 2000 parameters. More than 20 vessels and 5 aircraft participated in the study. Sampling near the fire and in the smoke plume was conducted from remote-controlled boats, helicopters and an ROV (submersible) that were deployed beneath the slick. At more distant locations, a tethered blimp, conventional helicopters, fixed-wing aircraft and a variety of vessels were used.



Figure 6 A view of the Newfoundland Offshore Burn Experiment (NOBE). Only four of the 20 vessels are shown.

The oil was released from a supply-type ship. A 700-foot section of boom was used. Once sufficient oil was in the boom to sustain combustion, it was ignited using a Helitorch. The oil was released into a fire-resistant boom and burned within it. Air emissions were monitored downwind using two remote-controlled boats, a research vessel and from an airplane. The plume itself was sampled by two remote-controlled helicopters and a blimp. Water samples were collected from the remote-controlled sampling boats, and air and water temperatures measured from the same vessels. The fire-resistant boom was equipped with thermocouples to monitor temperatures directly impacting it and those in the water directly underneath the fire. A submersible was deployed under the burning slick to monitor temperatures and take photos. A small boat monitored and possible escaped surface material and took samples of the burn residue after the burn.

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The fire-resistant boom used was a commercial version along with some experimental sections. The middle sections near the burn were equipped with a number of thermocouples to measure the temperature on the boom. The boom was backed up by another boom, an offshore type, about one kilometre down current. The fire-resistant boom was towed by a major vessel and the opening was maintained by two vessels towing outward at an angle of approximately 45 degrees. Tow vessels were equipped with current meters to ensure that they are able to maintain a forward speed of 0.5 knots. Command and control operations took place from a major vessel of the Canadian Coast Guard, the ANN HARVEY. One helicopter was used both to ignite the slick and put out flares

The procession was led by the 224' CCG vessel *Sir Wilfred Grenfell* that served as the supply and oil discharge vessel. The fire boom was towed directly behind the *Grenfell* with 150-ft tow lines. Two, 14-ft remote controlled boats, and a 36-ft sea truck serving as a platform for the tethered blimp, were approximately 50, 100 and 150 m, respectively, behind the apex of the fire boom. One hundred metres behind the sea truck, the secondary containment boom was towed by two, 46-ft vessels (i.e. 250 m behind the fire boom).

A number of other vessels were stationed farther from the main procession. These included several Boston Whalers from which routine sampling was conducted and other vessels that served as platforms from which the remote controlled boats, remote controlled helicopters and the ROV were operated. The command vessel was the 272-ft CCG vessel *Ann Harvey*. Two 100-ft vessels were chartered to accommodate scientific observers and visitors.

## Special feature – In situ burning (continued)

to guide the procession into the wind. Another helicopter was used to provide photography. Two charter ships were engaged to bring out observers. They were also used as platforms for some of the documentation and air measurement. Several smaller boats were used for other sampling purposes and for controlling the remote sampling boats and a remote-underwater vessel.

Burn One was started using a Helitorch. Reports from the helicopters and both airplanes indicated that the smoke plume bifurcated after about 2 km downwind. A small part remained with the inversion layer at about 0.5 km and the main portion split with one portion turning southeast and one turning east after rising about 2 km. The average discharge and burn rate for burn 1 were 915 L/min. The fire-resistant boom was inspected after the first burn. Some signs of fatigue in the stainless steel core were observed at a point about 10 cm from the stiffeners. Some of the Nextel fire-resistant fabric was missing from these areas as well. The boom was still fit for another burn.

The crews re-fit the equipment for the second burn. The first run of the Helitorch ignited the oil. Some oil was again splashed over. The oil outside of the boom burned completely leaving only small patches of residue which drifted back into the secondary recovery

boom. The wind was 8 to 11 km/hr and this resulted in an approximate 45 degree angle for the plume. This burn was characterized by its "classical", regular plume behaviour.

The pump rate for this burn averaged 610 L/min. Pumping was stopped after 1 1/4 hours of burn time when some small pieces of the fire-resistant boom were lost. There was no oil released. The duration had already exceeded planned sampling times and most samplers had already been stopped.

### Summary of Analytical Results

#### Oil Analysis

The oil was analyzed for physical properties and PAHs as well as for alkane proportions. A most interesting result is that the residue appears to be an oil with an evaporative loss of about 45% by weight. The residue had a density of about 0.95 g/mL and a viscosity of about 100,000 mPa.s. The distribution of alkylated PAHs in the oil was similar to that of the starting oil, but somewhat less.

#### Particulates

Particulates were collected by a number of means. Particulates were at moderate levels under the plume at the locations sampled by the remote-controlled boats. Particulate levels dropped to background levels at the remote sampling station about 1 km downwind. The amount of particulate material in the respirable size range was very low.

#### Polyaromatic Hydrocarbons (PAHs)

PAH analysis of particulate material and air itself was performed at several different sample locations and by several different means. This comparison showed that the PAH's are largely consumed by the fire. The amounts of PAHs detected at the Newfoundland burn were a fraction of that detected in previous burn trials. This may be indicative of a more efficient burn.

#### Aldehydes and Ketones

Aldehydes and ketones were measured using a specialized technique. Data indicate that the concentrations are near background levels and actually are higher during the times when the oil is not burning.

#### Dioxins and Dibenzofurans

The high-volume samples taken on the remote-controlled boats and on the downwind station were also analyzed for dioxins and dibenzofurans. The values were at background levels. This confirmed previous studies which show that dioxins and dibenzofurans are not produced by fires.

#### Combustion Gases

Tests were made for a number of gases, but CO, SO<sub>2</sub> and NO<sub>x</sub> are not above the lower detection levels. Carbon dioxide was measured around the burn and these measurements show that the CO<sub>2</sub> plume moves closer to the surface.

#### VOCs

Over 140 compounds were measured using SUMMA canisters. The levels of these compounds were even greater from an evaporating slick that is not burning.

#### Metals

Crude oil contains several metals in the ppm range. Metals could not be detected on soot particles.

#### Water-Borne Compounds

Water from under the burns was sampled and analyzed for a number of compounds. No compounds were detected in the water once the oil was on the water, during the burn or after the burn, above the background levels.

## Special feature – In situ burning (continued)

### References

- 1 Fingas, M., "In-situ Burning", Chapter 23, in *Oil Spill Science and Technology*, M. Fingas, Editor, Gulf Publishing Company, NY, NY, pp. 737-903, 2011
- 30 Fingas, M.F., F. Ackerman, P. Lambert, K. Li, Z. Wang, J. Mullin, L. Hannon, D. Wang, A. Steenkammer, R. Hiltabrand, R.D. Turpin and P.R. Campagna, *The Newfoundland Offshore Burn Experiment: Further Results of Emissions Measurement*, AMOP, 915, 1995.
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**To be continued**

## Publications

### FOR YOUR INTEREST – LINKS FOR RECENT ISSUES OF PERIODICALS

<a href="#">ASME EED EHS Newsletter</a>	News and commentary on HSE issues from George Holliday	February 18 issue
<a href="#">Intertanko Weekly News</a>	International news for the oil tanker community	No 7, 2013
<a href="#">Intertanko Weekly News</a>	International news for the oil tanker community	No 8, 2013
<a href="#">Tech. Innovation News Survey</a>	US EPA: Entries for December 16-31, 2012	Issued Feb. 14, 2013
<a href="#">Soil &amp; Groundwater Events</a>	Upcoming events, compiled by Environmental Expert	February 2013 issue
<a href="#">Soil &amp; Groundwater Newsletter</a>	Compiled by Environmental Expert	February 14 issue
<a href="#">Environmental Expert</a>	Soil and Groundwater Product Alert	February 18 issue
<a href="#">EMSA Newsletter</a>	News from the European Maritime Safety Agency	February 2013 issue

## Events

### GLOBAL INITIATIVE SOUTH EAST ASIA (GI SEA) WORKSHOP AND LAUNCH EVENT

Wednesday, March 20, 2013 (All day) - Thursday, March 21, 2013 (All day) Hotel Borobudur, Jakarta, Indonesia [More info](#)

## Training

### AUSTRALIA: TANKER ROLL OVER EXERCISE AND WORKSAFE LED TANKER INSPECTION

The NBTA together with CROIERG, TISC and WorkSafe is organising a **tanker roll over exercise** as well as a **WorkSafe led tanker inspection** on the afternoon of the 7th March at Sandown Racecourse in Melbourne. This event is part of the Sandown Drive Days that are run over the 7th and 8th March. See <http://www.vtadrivedays.com.au> for more details on the Sandown event.

## Company news

### ISCO MEMBER, MARINE POLLUTION CONTROL, IN OIL-IN-ICE EXERCISE

Culminating a three-year effort, Marine Pollution Control, in conjunction with the Coast Guard's Research, Development, Test and Evaluation (RDT&E) program, will participate in an Oil-in-Ice Exercise in St. Ignace, MI, the week of February 18. The exercise is designed to demonstrate the use of a variety of technologies—from skimmers to fire boom to sonar—and techniques like ice "herding" to help clean up oil in arctic conditions. Additional participants and observers will include personnel from a number of Coast Guard jurisdictions (including the arctic region), other government agencies, and the spill response industry.

The 2013 exercise is similar to last year's successful demonstration, although this year it will include additional technologies—an autonomous underwater vehicle and an intelligence gathering dirigible, for example—and the ice conditions are expected to be more difficult. Bill Hazel, MPC's Director of Marine Services, gave a presentation on the 2012 exercise at the recent No Spills Conference in Traverse City. "As the arctic region becomes increasingly important to the country's strategic interests initiatives such as this Oil -in-Ice demonstration will help ensure that we move forward while continuing to protect the environment," Hazel said.

Marine Pollution Control is generally regarded as an expert and innovator in spill response and advanced technologies. Founded in 1967 by David Usher, who continues as Chairman, it was the first oil spill clean-up company in the Great Lakes and one of the first in the country. For more information, visit [www.marinepollutioncontrol.com](http://www.marinepollutioncontrol.com).

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