New Horizons? Dealing with Major Oil Spills from Non-Tanker Sources

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(S1) Introduction

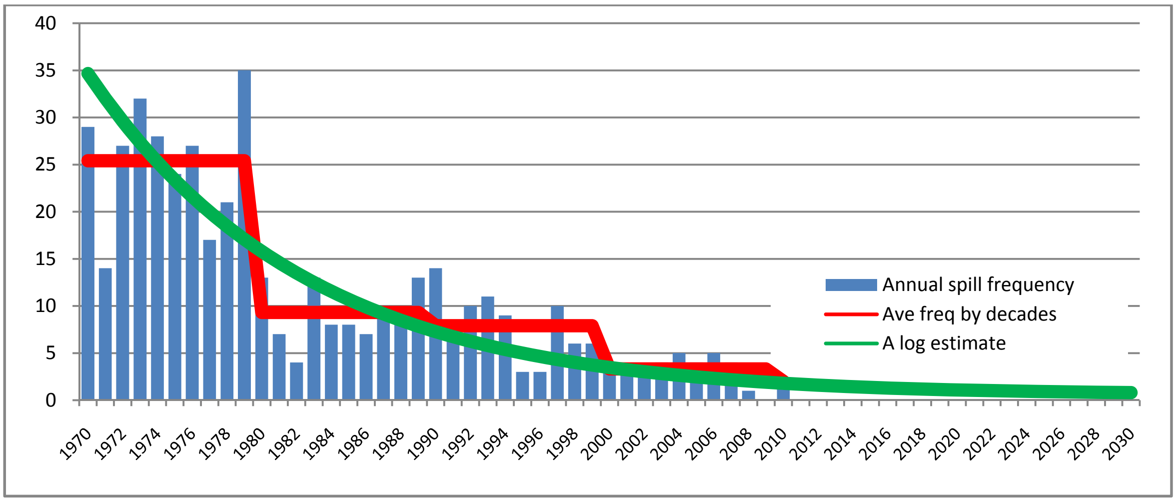
I would like to thank you for the invitation to attend this year's workshop and the opportunity to give the Keynote Speech. You may find it ironic that a representative of the International TANKER Owners Pollution Federation is speaking on the topic of non-tanker oil spills. I do!

The fact is, however, that large oil spills from tankers have been falling in number over the years. At the same time, overall public sensitivity to smaller, non-tanker spills has grown at an even faster rate! As a result, ITOPF has found it beneficial to diversify over the past decade into non-tanker incidents... Where we are busier than ever!

(S2) I will start off my talk today with a few words on this topic of declining tanker spills and ITOPF work with non-tankers. Then I think it best to devote a couple minutes talking about just what we mean by the terms "non-tankers" in terms of sources and the terms "large" and "major" in terms of size. Thirdly, we'll look at just what the new dimensions for response to non-tanker spills might be, before reviewing some of the main issues in marine oil spill response, whatever the source. This leads nicely into a short outlook on needs for preparation and R&D.

(S3) Just what are the global trends in "large" tanker incidents?

(S4) The graph shows the evolution of tanker spills per year over the past 40 years. The blue columns show the spill frequency for what we at ITOPF define as "large" incidents, i.e. those over 700MT. Along the bottom of the graph are years, 1970 to present and beyond.



As you can see, back in the 1970s, there were between 15 and 35 large incidents EACH YEAR! The red line is a stepped average for each of the decades. It has been clearly marching downward. The green line is a logarithmic estimate I recently fitted to describe, in mathematical terms, my own personal outlook for the future. My best guess is that there will be an ever-decreasing, yet positive number of such large incidents, perhaps 0-3 per year on average...

No matter how you look at it, the trend is clearly downward.

(S5) Trends in volume spilled in ‘large’ tanker incidents?

(S6) That was a look at the spill FREQUENCY. I recently took at look at ITOPF data on spill VOLUMES. I was interested to see if I could identify any such obvious trends in the size of “large” spills. Besides getting fewer, are they getting any “smaller”?

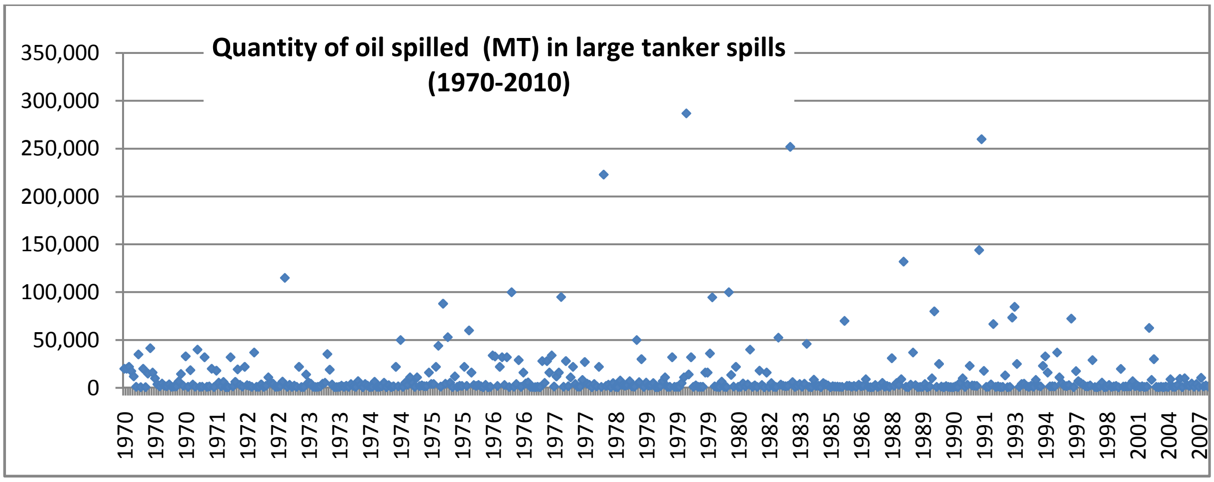


Figure 1: A look at the quantity spilled in each of the ‘large’ tanker incidents (>700 MT)

In order to study this I plotted the quantity spilled in each of the “large” tanker incidents on ITOPF records. This is what the data looks like.

Basically, nearly 500 large tanker spills over 40 years are set in chronological order across the bottom and the quantity spilled is marked on the vertical axis. Because there were so many more large spills back in the 1970s, you will notice that this one decade takes up most of the space in the graph. Otherwise, I ask, do you see any trends? I don’t.

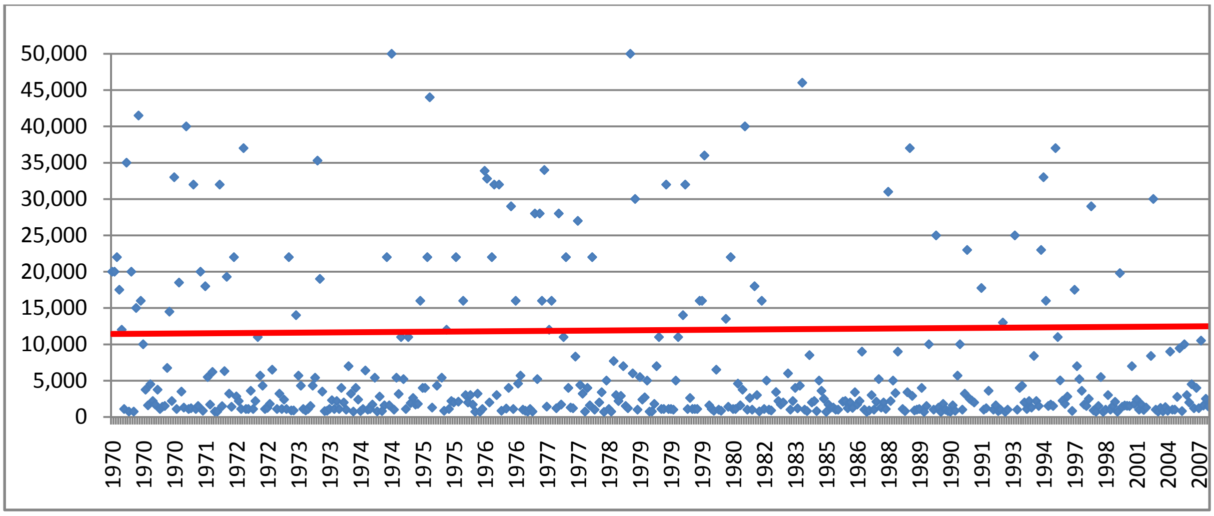


Figure 2: A trend line for the quantity spilled in ‘large’ tanker incidents (>700 MT) (note: cases with >50,000 not shown)

(S7) To make it easier on our eyes, we can ‘zoom in’ a bit and look at the spills up to 50,000 MT. I’ve added a simple trend line in red. Clearly, it doesn’t make any meaningful, mathematical sense, other than to say that there is, perhaps no trend in the typical size of “large” spills. They can still be as large as ever before.

We must, of course, be careful to remember, that these 'large' cases are still fewer in number, thus resulting in a much lower total quantity spilled each year. In fact, it is likely that many of the "extremely large" cases that were experienced in decades gone by are now just "large" cases or perhaps even only "near misses".

It is also worth mentioning that although spill size in terms of quantity is unchanged, the cost certainly isn't. I don't have any statistics on this, but we at ITOPF have little doubt that spills are getting more expensive to clean up...

In summary, we must remain prepared for tanker spills of any size. This is a point that our friends over in Korea will understand all too well. I am, of course, referring to the recent HEBEI SPIRIT case which I know you have discussed in great detail in past PAJ conferences.

(S8) Trends in ITOPF activity

Considering that ITOPF is called out for a great part of the most significant marine oil spills, it is interesting to spend a few minutes looking at trends in our activity. I mentioned at the start that ITOPF has diversified. Our origins go back to the days of frequent large tanker spills, but our expertise has always been relevant for spills from any source into the marine environment. For this reason, over the years, we've been to spills from every sort of vessel, oil rigs, pipelines, terminals, tank farms, and the like.

Figure 3: Examples of non-tankers on ITOPF books

(S9) The big shift in our work has been, of course, to non-tanker vessels, the owners of which have been able to carry ITOPF "Associate" status since 1999. These pictures show you examples of the sorts of non-tankers we deal with, some more often than others. The incidents we have intended have involved: Roll-on-roll-off ferries, bulk carriers, general cargo vessels, container carriers, cruise ships and passenger ferries, car carriers, fishing boats, floating storage units, and reefers. On our books we have, of course, practically every conceivable type of commercial non-tank vessel.

(S10) In terms of our activity and the split between tanker and non-tanker cases, the following bar chart really shows the shift in our field work over the past decade. The blue bars represent ITOPF attendance at TANKER incidents <u>of all sizes</u>, worldwide. The red bars show our attendance at NON-TANKER incidents, again, <u>of all sizes</u>. As you can see, coming into the start of the decade we still sent to more tanker incidents than non-tankers (i.e. The blue bars are sometimes higher than the red up to 2005). In more recent years, however, the red bars have clearly outweighed the blue bars. We go to many more non-tanker incidents these days.

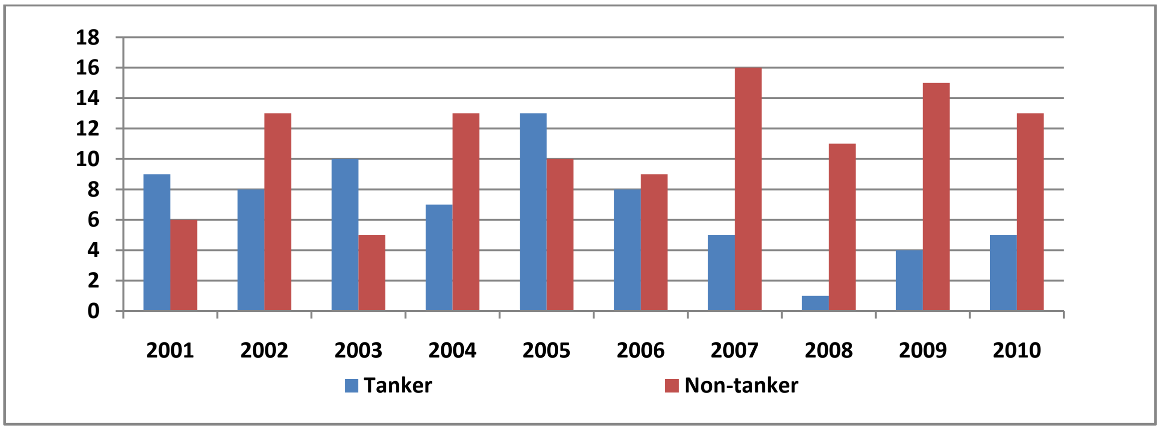
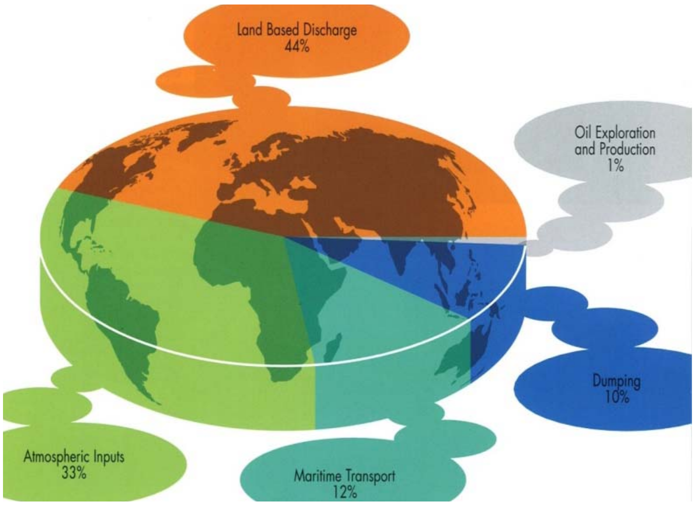


Figure 4: ITOPF spill activity by tanker or non-tanker

(S11) Definitions: *"non-tanker", "large"/ "major"*

(S12) Turning now to a few definitions, just what are 'non-tanker' sources of oil on the one hand, and what do we mean by 'large' or 'major' incidents on the other?



An interesting place to start is to look at global estimates for oil input into the sea and work out which ones might be relevant for us as 'non-tanker' sources with emergency character, the types that might result in "major" incidents.

The Joint Group of Experts on the Scientific Aspects of marine Environmental Protection, also known as "GESAMP", has studied this and published estimates, albeit some years ago.

Overall, they found that 44% comes from all types of Land-based discharge, 33% from Atmospheric inputs, 12% from Marine Transport, 10% from Dumping at sea, and 1% from Oil Exploration and Production.

It is relatively easy to see that the greatest part of this oil input would not actually be from *accidental* oil spills, the type which oil spill responders focus their attention. Instead, the majority of oil entering the environment comes from chronic, non-point sources. Think in terms of run-off from roads, industrial effluent, air pollution and the like. These are things best dealt with through preventive regulation...

(S13) In order to put our finger on non-tanker threats of major oil spills, it is best to focus on sea-based *activities* that have the potential to release large amounts of oil very quickly, i.e. accidentally.

Obvious candidates include bunker spills from non-tanker vessels, E&P, and pipelines, as well as the operation of shore-based facilities like terminals, tank farms, or other industrial facilities.

Bunker spills are growing in relative importance. Not because shipping is getting more dangerous, of course. Instead, it is because shipping trade has expanded greatly at the same time that the population has become more environmentally aware and is demanding greater response to ever smaller incidents.

Following last year's media frenzy in the Gulf of Mexico, I suspect that there are few people anymore who do not know that oil drilling can lead to serious oil spills. We've got The same may now be true in Asia after the Pipeline spill in Dalian.

I look forward to the following speakers who will tell us much more detail about these and other such incidents around the world.

(S14) Turning briefly to the terms "major" and "large", there appears to be a tendency for people to equate the two. In other words, people often think of impact as being a function of the volume spills: "Big is bad". Now, of course, if all else is equal, response to larger volumes is more demanding than response to smaller volumes. Impact, time, and cost will increase as volume increases.

The fact is, however, that "other things" are never equal. There are a number of other factors that are equally important, including the type of oil spilled, the location of the spill and direction of drift, the sensitivity of the area, and even the speed or rate of release.

(S15) Rather than give some artificial definitions, consider the following two examples.

Late last year there was a collision off the Netherlands between 2 large vessels, a tanker, the MINDORO and a container vessel, the JORK RANGER. The result was a huge hole in the side of the tanker and the entire contents of one tank of white product lost to the sea. That was 5,700 MT! The incident occurred a short airplane flight away from our office and we were notified very quickly. We had a technical advisor ready to catch a flight within a couple hours. The fact is, though, that the product evaporated so quickly the authorities told us not to bother coming, there was simply nothing to see or do within only a few short hours.

(S16) A totally different matter was the loss of a small general cargo vessel here in Japan almost 3 years ago next Saturday. In addition to the tragic loss of life when the GOLD LEADER sank in the Akashi Straits after a dangerous 3-way collision, a very small oil spill started which had devastating effects on the local Nori production and fisheries. The wreck slowly leaked very small amounts of oil into an ultra-sensitive location. Matters were complicated by the fact that the wreck was in very deep water, the vessel traffic above is phenomenal, and the currents are exceptional. Finally, since the volume involved was very low, there was simply no sense in even trying to mount an underwater recovery or clean-up of the oil in the vessel. Such operations are only suited for bulk removal...

In summary, it must always be kept in mind that the importance of an incident is measured on impact, not quantity spilled. Non-tanker impact can be less than, equal to, or greater than the impact from a tanker incident.

(S17) New Dimensions with Response to Oil Spills from Non-Tankers?

Clearly, non-tanker spills are different in ways from typical tanker spills, if there is such a thing.

(S18) Starting with non-tanker vessels incidents, three key attributes are worth noting: (1) The fuels requiring response tend to be persistent, (2) when released at depth the outflow can be slow, continual, and long-enduring, and (3) the worst case scenarios tend to be lower in terms of oil volumes.

(S19) It may seem obvious, but it is worth keeping in mind that tankers can spill large amounts of any type of crude or refined oil they carry as cargo, non-tanker vessels tend to carry large quantities of persistent (i.e. Heavy Fuel) Oils and smaller amounts of the lighter, more refined products. Also, the HFO tanks tend to be more exposed, structurally, than the diesel and gas oil tanks. This means that large spills from non-tankers tend to be HFO. The implications are serious, of course, because HFO evaporates less, it always requires response if it strands, and the response operations produces more waste, the heavier the product involved.

(S20) One of the more troubling problems we come across in spill response is dealing with ships that sink and release oil from depths. Non-tank vessels pose a special challenge because the releases at depth are often very slow and continual. This may sound good, but it isn't. The thing is that the multiple tanks, piping, and internal structures lead to a continual drip, drip that can result in exacerbated impact on the surface. If all the oil comes out at once, an efficient clean-up operation can deal with it and recovery can soon begin. The continual leak, however, may require some long-term maintenance at best or be a continual source of new damage at worst. Further, because the tanks involved are small compared to the bulk cargo tanks on a tanker, underwater recovery options will be limited.

(S21) On the plus side, of course, smaller fuel oil quantities distributed across fewer tanks means lower worst case release scenarios. Balancing that out, however, is the fact that tankers rarely loose all their tanks. In fact, damage to multiple, non-adjacent tanks is rare.

(S22) Turning now to E&P, it is easy enough to see that there are several key attributes of rig and well releases which may make these quite different from tanker spills we have seen in the past. There may very well be a greater degree of complicated surface activity that hinders the oil response *per se*, the oil release at depth may very well be <u>under pressure </u>(!), there are much larger worst-case release scenarios, and on the plus side, the location is fixed and the oil type is known.

(S23) The co-ordination of efforts during a major response is no trivial matter, as was demonstrated during the DWH incident. Just imagine the difficulty of responding to surface slicks when there are countless supply vessels, drilling platforms and the like operating all around (!). It is true that a tanker salvage operation can result in quite a flotilla of response vessels, but the situation is an order of magnitude more complicated with a blow-out situation such as this. As we will hear, there are also health and safety issues for all those on board these vessels.

(S24) Two of these pictures are not like the other. The center one shows a deep sea release from a tanker, the PRESTIGE, driven alone by the fact that the oil is more buoyant than the water. It wants to rise to the sea surface and does so in large chunks of "pure" oil.

The other two photos show DWH release from the well head. BP estimated the release pressure at 30,000 psi. One key difference, as we all now know, is that this sort of release leads to some 'natural' dispersion. Also, because it represents a significant source of mixing energy, it provides great scope for introducing chemical dispersants.

There is, of course, a great amount of study to be done before we understand how this works and what the implications are for the sub-surface fate of this dispersed oil.

(S25) Apologies for stating the obvious, again, but rig/well releases offer much large worst-case scenarios in terms of lost volumes. It is not just that the overall quantities held in a tanker are less than those in the reservoir, they are compartmentalised.

The HEBEI SPIRIT tanker, for instance, was carrying nearly 210,000MT of crude oil when it was struck by that barge back in 2007 and ripped open. The total quantity of oil in the ship that could feasibly have leaked out was, therefore, about one third that which is said to have been lost in the Deepwater Horizon incident. In other words, a very large amount.

And yet, only a small part of the HEBEI SPIRIT oil actually leaked out. The effects were devastating, but they could have been worse.

The DWH is estimated, on average to have lost 7,500MT per day for 87 days. The upside to this is that the quantities and duration are sufficient in well spills to merit consideration of in situ burning as an option. This is relatively difficult to consider with tanker incidents

(S26) Finally, it is important to not that there are far f*ewer site variable*s when dealing with rig/ well releases because the fixed location and known oil type.

This means that the oil behaviour can be studied in advance, allowing the optimal pre-selection of equipment. There should be greater knowledge on local currents, and sensitivities, thus enabling better planning and knowledge of responsibilities.

(S27) Turning to releases from pipelines and shore-based facilities, there are a few key characteristics worth considering. First, the response is more likely to include shoreline clean-up because the released oil starts off close to shore.

Many facilities are built on rives, where containment and other principle strategies are especially problematic. Sub-surface releases are also possible, especially with pipelines. Buried oil on land may be an important issue. Losses from facilities are often likely to be refined products.

In terms of worst case scenarios, large releases are in theory possible, especially from tank farms. However, the probability of lost product reaching water is usually held in check by significant physical protection measures, such as permanent containment berms. Oil losses from terminals are very similar to ship accidents at berth and are generally limited in scope given emergency shut-off and other safety measures.

(S28) Marine oil spill response: Main issues, Preparedness, R&D

(S29) Regardless of these differences and the many more which I am sure we could think up, it is important to keep in mind that the basic elements of oil spill response in the marine environment are the same, regardless of the source: First, stop outflow. At the same time, deal with floating oil, whether through the use of dispersants offshore, containment or recovery systems. Monitoring the evaporation, drift, and other developments will be key. Should the oil come ashore mount operations there and, from the start, deal appropriately with waste.

(S30) While this sounds easy – and I think it really should be – time after time we run across the same issues with all spill response operations. It probably wouldn't be too far off the mark if I made the following comments after any and every oil spill I go to: In order to improve, ensure: (1) adequate planning, (2) regular training & exercises, (3) meaningful, timely, dependable communication, (4) efficient use of appropriate equipment and materials, (5) environmentally sound and economic waste disposal, and (6) objective damage assessment.

(S31) There is, understandably, a lot of soul-searching going on these days in the spill response world. We're doing our part to help direct R&D in the best directions. Some of the ideas we have come up with, based on our experience are the following:

- Real-time tracking (visual and remote) of slick thickness & movement, rather than modelling.
- Increased skimming efficiency & encounter rates in rougher seas (i.e. more oil & less water).
- More accurate measurement of operational success, e.g. MT "pure oil" delivered by recovery units, burned, dispersed, etc.
- R&D on effects of large/ underwater dispersant use
- More integrated resource tracking and communication
- Greater availability of environmentally sound oil recycling opportunities

(S32) It is, of course, easy to 'try too hard' and overshoot the goal. Some of the common pitfalls that we often point out include:

- Reliance on complicated procedures/ machinery
- High expectations for "magic" chemicals/ solutions
- Inventions proposed at time of incident
- Inefficient use of materials
- Political meddling
- Doing things just to be see doing... something

(S33) Looking to the future, I see three key areas where the lower frequency of large spills will challenge the industry.

First, keeping intelligent responders adequately occupied between spills.
Second, financially bridging the gaps between large spills.
Third, keeping ever-more sophisticated equipment maintained and ready to go.

(S34) Conclusions
In all our spill response work, we need to ensure that we consistently do what we already know how to do. This includes projecting the correct, confidence-inspiring image of professionals at work to the public and politicians, promoting productive, balanced, spill-specific R&D, basing decisions on the balance of true cost with true gains, and maintaining scientific and technical integrity.