# OFFSHORE SAFETY MANAGEMENT
## CHAPTER 8

*1st Edition*

# OFFSHORE SAFETY MANAGEMENT



Sutton, Ian S.
Offshore Safety Management — Chapter 8

Published and distributed by Sutton Technical Books, Houston, Texas

## WARNING — DISCLAIMER

This ebook provides information in regard to the subject matter covered. It is distributed with the understanding that the publisher, the author and any other advisors are not engaged in rendering legal, accounting or other professional services. If legal or expert assistance is required the services of a competent professional should be sought.

It is not the purpose of this ebook to reprint all the information that is available to the author and/or publisher, but to complement, amplify and supplement other texts. You are urged to read all the available material, learn as much as possible about the topics covered, and to tailor the information provided here to your needs. For further information and other sources, see the references provided at www.stb07.com/citations.html.

Every effort has been made to make this ebook as complete and as accurate as possible. However, **there may be mistakes**, both typographical and in content. Therefore this text should be used only as a guide and not as an ultimate source of information and guidance on the topics covered. Furthermore, information on these topics may have changed since the release date of this ebook.

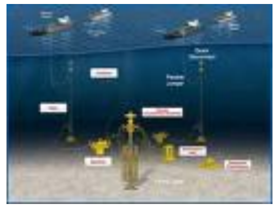
The examples provided, which are fictional, have been created specifically for this ebook series. This ebook does not information about any specific plant, process, company or individual. Nor does it describe the policy of any company.

The purpose of this ebook is to provide information in the subject areas covered. The author and publisher of this ebook shall have neither liability nor responsibility to any person or entity with respect to any loss or damage caused or alleged to be caused, directly or indirectly by the information and/or guidance provided in this ebook.

# CONTENTS

**Chapter 8 — Offshore Safety Developments .................................................. 1**
Introduction .................................................................................................. 1
Leadership and Management ........................................................................... 1
Follow the Rules ............................................................................................. 2
Lack of Technical Expertise ............................................................................ 3
Convergence of Standards ............................................................................... 4
Spill Response ................................................................................................ 5
Helix Fast Response System ........................................................................ 6
Marine Well Containment System ................................................................ 6
Long-Tail Events ............................................................................................. 6
Black Swans .................................................................................................. 7
Short-Term Thinking ..................................................................................... 7
Conclusions .................................................................................................... 8

# CHAPTER 8 — OFFSHORE SAFETY DEVELOPMENTS



## INTRODUCTION

The previous seven chapters of this book have demonstrated how much the offshore safety management business has changed and matured in the quarter century since the Piper Alpha accident. Yet, as the Deepwater Horizon and Montara events illustrate, more progress needs to be made, particularly with respect to process and technical safety. The industry has not yet "arrived". No doubt on-going application of the SEMS and safety case techniques will lead to further improvement; yet there may also be a need to make a step change, and to find new ways of improving safety.

Some thoughts as to how the industry is changing and the effect that these changes may have on system safety are provided in this chapter. Topics discussed are:

- Leadership and management;
- Follow the rules;
- Need for technical expertise;
- Convergence of standards;
- Spill response; and
- Long-tail or Black Swan events.

## LEADERSHIP AND MANAGEMENT

The word *management* occurs throughout this book around 943 times, and the same word is to be found in the key phrases: Safety and Environmental *Management* Program and Safety and Environmental *Management* System. Yet it is useful to draw a distinction between management and leadership, and to examine how improved leadership could have prevented, or at least made less serious, many of the accidents discussed in Chapter 2.

Looked at this way, a manager is someone who develops and implements systems for activities such as Operating Procedures, Training, Equipment Integrity and the selection of lifeboats. In principle, a management system will, to a certain extent run itself, regardless of the specific individuals involved. Leadership, on the other hand, is highly dependent on the personality of the person in charge. Leaders need to make difficult decisions, often under considerable time pressure —all the while realizing that they are the officers in charge of troops who may at any time be facing the equivalent of enemy fire. *Leaders must lead.*

Leadership is often described in terms of creating systems, and then encouraging all employees and contract workers to adhere to those systems. For example, a recent article states, "Leaders must take the responsibility to influence behaviors regarding process safety" (Louvar 2011).

While this statement is certainly true, such a function is more to do with management than leadership. A leader recognizes that they are the officer in charge of troops whose lives may be threatened, and they must be willing to take very tough decisions under stressful and dangerous conditions.

Arnold (2010) states, “We do not need another level of analysis and documentation to improve safety — we do need to create organizations which encourage their people to take risks for safety”. In other words, leaders must be willing to use their judgment to take the right actions in real time, even if those actions lead to a large economic loss.

In the case of the Piper Alpha catastrophe (page **Error! Bookmark not defined.**) it is thought that seven men died in the initial explosion. Yet the final death toll was 167. The fire that followed the initial explosion burned for hours even though the inventory of oil, hydrocarbon condensate and gas on the platform was minimal — *had the incoming riser valves been closed.* It was during the on-going fire that the additional 160 men died of burns, smoke inhalation and drowning.

The death toll was so high due to lack of leadership. Piper was a hub platform that received oil and condensate from other platforms in the area, one of which was Tartan. When Piper exploded the managers on Tartan could see perfectly well what was happening — Piper was in line of sight, and visibility (even though it was night-time) was good. Yet Tartan continued to pump condensate into the raging inferno on Piper because, in the words of the OIM, “no one told me to stop”. This person simply did not have the nerve to shut down production, probably because he was afraid of getting “into trouble” if he had done so.

Neither was there adequate leadership on Piper itself. Many of the men on board were in quarters at the time of accident (because it was night time). They had not been properly trained, so they stayed together until most of them succumbed to smoke asphyxiation. Had there been true leadership on the platform, an officer in charge would have led them to a location where they would have had a better chance of escaping.

It would appear as if lack of leadership was also a factor in the Deepwater Horizon incident (although the final reports were not available at the time of writing). The men on the rig were experiencing serious problems for two days, and some of the decisions that they made — such as the use of a long string — seem to have been forced by economic pressures. Yet no one at senior level (either on the rig or the onshore office) had the courage to call a time out (knowing that doing so would cost $1 million per day). They were not willing to “take a risk for safety”.

The Blackbeard event (page **Error! Bookmark not defined.**) showed how leadership should work. The members of the drilling crew were worried about the high temperatures and pressures that they were observing. They decided to call on senior management for guidance. In the end the decision went to the top of the company — and the decision was to declare a dry hole (which, of course, it was not). They were willing to abandon a $100 million plus investment in order to avoid a calamitous accident.

## FOLLOW THE RULES

Many of the incidents discussed in Chapter 2 could have been avoided had those involved simply followed the rules. In the case of the Santa Barbara blowout (page **Error! Bookmark not**

**defined.**) the persons in charge did not obey the standards set by the regulators. The same can be said about the recent Montara blowout (page **Error! Bookmark not defined.**). The report to do with that event states,

> *Well control practices approved by the delegate of the Designated Authority, the Northern Territory Department of Resources, most likely would have been sufficient to prevent the Blowout if PTTEPAA had adhered to them and to its own Well Construction Standards.*
>
> *These difficulties were compounded by the fact that senior PTTEPAA personnel had only limited experience of batch drilling and batch tieback operations and did not fully comprehend the implications of such operations.*

While it is easy to say that people must follow the rules, once more leadership enters into the mix. People don't skirt the rules for the sake of it — they do so usually because they are trying to make more production more quickly or, as apparently was the case with PTTEPAA, management did not know the rules thoroughly enough. A strong leader will resist the pressures to cut corners or to make ill-informed decisions. He or she will insist that the rules, procedures and standards be followed unless it can be demonstrated that doing so would give rise to an unsafe situation.

## Lack of Technical Expertise

One engineering company used the slogan shown below as a bumper sticker.

> There's No Substitute For
> Knowing What You're Doing

*Bumper Sticker*

Anyone who has led a process hazards analysis (PHA) will immediately understand the significance of the above phrase. The literature to do with PHAs is replete with lengthy discussions as to the techniques to be used, the manner in which the discussion is to be organized and the guidewords to be followed. However, if the PHA team consists of people who really understand the facility — people who *do* know they they're doing — then they will quickly identify the important issues and come up with sensible findings, regardless of the formal organization of the study.

A phrase sometimes used in the petroleum industry to describe the loss of experienced personnel is "Big Crew Change" (Gell 2008). The phrase is mainly used with regard to the large number of baby-boomer generation engineers and technical experts who will be retiring after the year 2010. These experienced personnel are not being replaced by sufficient younger people with comparable technical skills and experience. For example, it has been reported (Corrigan 2005) that,

> *Between 1983 and 2002, the number of U.S. petroleum engineers declined from 33,000 to 18,000 . . .*

There is some company knowledge that cannot be brought in off the street. If a person has worked at a company for many years, particularly in a specialist department, and he or she leaves without having trained a replacement, there is almost certain to be a loss of “corporate memory”. People brought in from the outside may be very knowledgeable, but they cannot possibly know all of the history and background as to why things operate the way they do at this particular location.

A particular concern is that the number of experienced people in many organizations has been reduced, and the gaps between the layers of supervision and management have increased. Hence, many process issues that were previously handled quickly and effectively on a semi-formal basis by experienced personnel who knew each other very well, and who also had an intimate knowledge of the processes for which they were responsible, now must be handled in a more formal manner.

In other areas of plant operations, the loss of personnel is compensated for by using increasingly powerful computer systems. For example, a DCS (Distributed Control System) can carry out many of the functions previously performed by several operators. Similarly, sophisticated design software lets one engineer carry out calculations that previously had to be done by a team. Yet there remain certain actions that have to be carried out by people; the loss of skilled personnel in these situations represents a true loss. No computerized system can develop the intuitive insights of an experienced operator or design engineer.

There is no easy solution to the dilemma of loss of experience. Once an experienced person has left the organization it will take time to build up qualified replacements. Training courses and seminars can help — but they are likely to be too generic and high level to provide the knowledge and experience that is needed.

All that can be said is that companies should (a) be cautious about losing their experienced people by “offering them the package”, and (b) should allow plenty of time for the junior people to absorb the knowledge of their more senior counterparts.

## Convergence of Standards

Much ink has been spilled (or toner cartridges consumed) in discussions regarding the relative merits of SEMP/SEMS and safety case approaches to improving offshore safety. To some extent the choice of approach will partly depend on local rules and regulations, and also on environmental conditions. In the North Sea, for example, much of the equipment is enclosed to protect it from the weather. This is not the case for Gulf of Mexico facilities, where weather conditions are generally mild (except when a hurricane comes through). The presence of enclosed spaces on North Sea platforms increases the likelihood of a confined vapor cloud explosion, and thus affects the types of safety analyses that are carried out. Also, going overboard in the North Sea is a very serious matter, whereas the waters of the GoM are far more benign, as demonstrated in the Mariner incident in which 13 men entered the water, but no one was injured.

In spite of these differences, the reality is that there is a good deal of overlap between the Safety Case and SEMP/SEMS approaches. Both result in the development of a Safety Management System, and both are basically goal-based and non-prescriptive, although SEMP and SEMS do reference a large number of prescriptive standards, mostly from the API.

Not only are there strong similarities between the two systems, they appear to be converging. In the Gulf of Mexico the original approach was to manage the safety of large numbers of relatively simple, shallow water platforms through the use of generic standards. This approach made sense when the platforms are similar to one another and when a single platform is not all that expensive. It does not make sense to prepare a safety case for each and every one of these facilities. However, with the mover to deep water drilling and production, the situation has changed. Now each drill rig or platform is a unique design, and its cost is enormous — usually well over a billion dollars. This means that it makes sense to develop a facility-specific safety analysis, in other words to prepare a document much like a Safety Case.

In the North Sea the trends are in the other direction. The production of oil and gas is declining quite rapidly. Consequently, many of the major oil companies have sold their producing platforms to smaller organizations some of which are little more than holding companies. These new owners do not have the financial or organizational resources to develop and manage safety cases. Instead, they say, "Just tell us what to do". They favor a more prescriptive approach to managing safety, just as companies did in the early days of work in the Gulf of Mexico.

## SPILL RESPONSE

If the worst happens, and there is a big release of oil or gas to the ocean, industry needs to be able to respond quickly and effectively. The Deepwater Horizon incident demonstrated that such a response capability was not in place — it took industry three months to cap the leak from the damaged well head and to direct the flow of oil to a safe location. The National Commission report to the President says the following about that event.

> *Just as the events of April 20, 2010 exposed a regulatory regime that had not kept up with the industry it was responsible for overseeing, the events that unfolded in the subsequent weeks and months made it dismayingly clear that neither BP nor the federal government was prepared to deal with a spill of the magnitude and complexity of the Deepwater Horizon disaster.*

Industry in the Gulf of Mexico responded by developing two projects: Helix and the Marine Well Containment System (MWCS). Helix is based on the equipment and systems that were used following Deepwater Horizon. MWCS is a brand new system.

(The National Commission report to the President notes that neither of these projects will necessarily address the next crisis. For example, if a drill rig were to fall directly on top of the well head these systems would not be able to access the spill site. Moreover, these systems are limited to a water depth of 10,000 feet, even though industry is developing the technology to drill in much deeper water.)

### Helix Fast Response System

The Helix Energy Solutions Group, headquartered in Houston, Texas, is an international offshore energy company that was instrumental in developing the containment systems used for the Macondo well blowout. Based on that experience, the company developed the Helix Fast Response System (HFRS). Participants in the project pay a retainer fee and a day rate to HFRS, who will provide the equipment needed to control a leak.

The system uses two existing vessels, The Helix Producer I and Q4000, a semi-submersible rig. A Stack Can, consisting of a Well Cap and Intervention Riser System, will transfer oil from the damaged BOP, wellhead or tree to a riser connected to Q4000. From there the oil will be pumped through a flexible riser to Helix Producer I which can carry out some processing. Oil would then be transferred to a tanker that would take it to on onshore facility.

### Marine Well Containment System

The Marine Well Containment System is being developed by a not-for profit organization that is sponsored by many of the large oil companies, including ExxonMobil (who are taking the lead), Royal Dutch Shell, Conoco Phillips and Chevron.

The system uses two ships that are in normal tanker service in the Gulf of Mexico. The ships are designed such that, in the event of an emergency, they can go to port, have the capture equipment installed on them, and then move to the location of the leaking oil well. Oil will be stored on the ships — which have been converted to FPSOs — and transferred to shuttle tankers, as needed.

The subsea part of the system will connect with the damaged well, and will have the capability of totally capturing the leak, even if the wellhead is damaged. An initial subsea response system was put into service in February 2011.

## Long-Tail Events

*When anyone asks me how I can best describe my experience of nearly 40 years at sea, I merely say uneventful. Of course there have been winter gales and storms and fog and the like, but in all my experience, I have never been in an accident of any sort worth speaking about. I have seen but one vessel in distress in all my years at sea. I never saw a wreck and have never been wrecked, nor was I ever in any predicament that threatened to end in disaster of any sort.*

E.J. Smith, Captain of the Titanic

At times it seemed as if industry had a response to the Deepwater Horizon catastrophe on same lines as that of Captain Smith. Many people were stunned that the event could have occurred, and managers from other companies were quick to point out that it could not have happened in their organization. Yet it did happen, and it became an industry-wide issue.

The nuclear power industry seems to suffer from the same “it cannot happen here” mindset. Probabilistic risk models, such as those discussed in Chapter 6, demonstrate that the likelihood of a nuclear power plant catastrophe is miniscule. Yet it seems as if such events occur every decade or so ─ each time caused by factors that no one had planned for.

- The Three Mile Island accident (1979) was attributed largely to failures in human factors and the ability of management and supervision to understand what was going on.
- The consequences of the Chernobyl catastrophe (1988) were greatly exacerbated by the decision not to construct a containment building.
- The Fukushima event (2011) is still unfolding. But already it is clear that a central factor in its cause was the decision not to build a sea wall high enough to handle a once-in-a-thousand year tsunami.

Each of the above incidents had causes that will probably never repeat. Yet the fact remains that a serious nuclear incident has occurred roughly once every ten to fifteen years. It would be naïve to believe that some other unique, hard-to-predict nuclear power event is not going to take place within the next two or three decades. Similarly, leaders in the oil industry must recognize that catastrophic events are going to occur more frequently “than they should”.

### Black Swans

The best-selling book *The Black Swan* by Nicholas Taleb showed how catastrophic events seem to occur with surprisingly high frequency and how they were always a surprise to the people affected. Although his work was carried out in the financial world, his lessons apply to any type of industry that has the potential for catastrophic events, which are sometimes referred to as “long-tail” events, which means that a larger share of events rests in the tail of a probability distribution than for a normal Gaussian distribution.

Taleb defines a Black Swan as having the following three features:

1. The event is a surprise;
2. The event has a major impact; and
3. After the fact, the event is rationalized by hindsight, as if it *could* have been expected.

Deepwater Horizon fit all of the above criteria. There is no question that, at the time, the event was a surprise. It certainly had a major impact. And, by now, the event has been thoroughly analyzed and explained.

### Short-Term Thinking

The natural response would be for companies to make the necessary investments to protect themselves against long-tail events, but, in the words of Taleb,

> *Unfortunately, most managers are rewarded on short term gains, i.e., on “flat earth” programs, not on preparing for a rare, even rare, event that cannot be defined or explained and that may not happen for a very long time.*

Sutton (2010) provides a fictional illustration of the above dilemma.

*Three years ago, under pressure from head office, we downsized our engineering department from 20 to 15 professionals. The savings helped the plant meet its financial goals (and also improved my bonus). Head office was so pleased with the result that a year later we cut another five engineering professionals. Some of the nagging reliability problems we have had since then can probably be attributed to these cuts, but we did improve profitability once again, and I have to accept that our operation is hanging in there.*

*Given our success in cutting costs, senior management decided to re-locate four of the remaining ten professionals to head office (200 kilometers away) so as to reduce travel costs and office expenses. So now we are down to six on-site engineers from the 20 we had just three years ago.*

*I'm worried that we may be heading for a major accident because we have cut our technical support so drastically. Maybe I should raise a warning flag. However, I can't be sure, so I'll just have to trust to luck. After all, serious accidents happen only rarely, and I expect to be assigned to a new position within a year or two. Then these worries become someone else's problem.*

Short-term thinking encourages a Just-in-Time management and the minimization of redundancy. Just as a bank needs a certain percentage of its money to be held in reserve, so the offshore industry needs to have reserves of skilled personnel and redundant equipment to protect against the "unknown unknown". (The development of the spill recovery systems discussed in the previous section is an example of this insurance mentality.)

Much of the short-term thinking approach can be attributed to cost pressures, and the need to "do more with less". In his book *Lessons from Longford* (Hopkins 2000) the author states, "when we extend the causal network < for an accident > far enough, market forces and cost cutting pressures are almost invariably implicated".

Referring to the Titanic disaster Brander (1995) writes,

> *Most of the discussion of the accident revolves around specific problems. There was the lack of sufficient lifeboats (enough for at most 1200 on a ship carrying 2200). There was the steaming ahead at full-speed despite various warnings about the ice-field. There was the lack of binoculars for the lookout. There were the poor procedures with the new invention, the wireless (not all warnings sent to the ship reached the bridge, and a nearby ship, the operator abed, missed Titanic's SOS). . .*
>
> *What gets far less comment is that most of the problems all came from a larger, systemic problem: the owners and operators of steamships had for five decades taken larger and larger risks to save money - risks to which they had methodically blinded themselves. The Titanic disaster suddenly ripped away the blindfolds and changed dozens of attitudes, practices, and standards almost literally overnight.*

## CONCLUSIONS

This book has attempted to provide an overview of the topic of Offshore Safety Management — with a particular focus on technical and process safety, and the avoidance of catastrophic events.

The development of process safety management systems such as SEMS and technical safety systems, such as the Formal Safety Assessment part of safety cases, has been discussed in depth. Although it is difficult to pin down how much improvement such systems have generated, there can be little doubt that they have been effective at reducing the number and severity of offshore accidents.

Yet more progress needs to be made, and it is likely that new ways of thinking will be needed to supplement the work that is already being done with SEMS and safety cases. It is suggested in this chapter that two quite disparate approaches are required.

The first is to encourage leaders within organizations to actually lead, as distinct from managing. They need to understand that they must, at times, “take a risk for safety”. The second approach is to do with following the rules and minimizing the number of black swans. And it is in this area that regulations play an important role.

Regulations encourage a “Follow the Rules” mentality because they give government agencies the power to enforce standards and recommended practices. Managers will respond to the fear that they may be cited in an audit, or, even worse, face severe personal consequences if there is a serious accident.

In addition, if a regulation is written so as to force companies to plan for rare events then everyone is working on the same terms. This is analogous to environmental regulations. Such regulations are expensive to comply with, and key people seem to spend too much time “filling out forms”. But without the regulations some companies would choose not to bother about pollution and so would have an unfair advantage over their more conscientious competitors.

Therefore, it is suggested here, is not whether regulations such as SEMS and safety cases are desirable ─ but whether they provide a sensible set of rules that that genuinely help improve process and technical safety. If they can help prevent future Piper Alphas and Deepwater Horizons, then they are justified.