RISKworld

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In This Issue

Welcome to Issue 25 of RISKworld. If you would like additional copies please contact us, and feel free to pass on RISKworld to other people in your organisation. We would also be pleased to hear any feedback you may have on this issue or suggestions for future editions.

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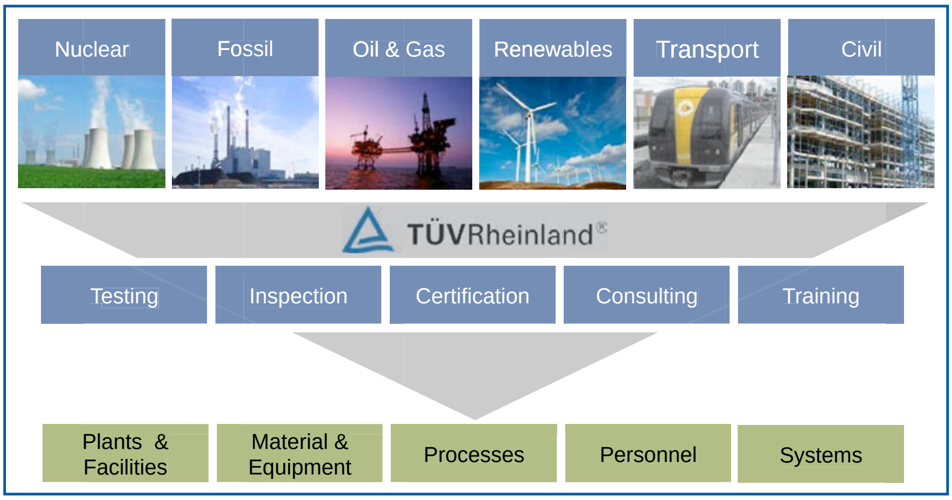

Our 25th issue of RISKworld celebrates an important milestone in the development of Risktec – joining the TÜV Rheinland Group (TRG) on 28th February 2014. TRG is a leading global provider of testing, inspection, certification, consulting and training services, employing over 18,000 people in over 500 offices in 65 countries (www.tuv.com).

This union, which received the unanimous support of the Risktec employee shareholders, will provide access to TRG's extensive global network of clients and offices. As a new global competency centre within TRG, Risktec will continue to operate as usual and all personnel will remain in their current roles.

Alan Hoy commented, "We have got to know many TRG people over an extended period of time and have been particularly struck by the strong alignment in the values and behaviours of our respective personnel. Both companies have high technical capabilities and standards, a high regard for their clients and personnel and a very collaborative approach to business. Joining the TÜV Rheinland Group feels like a very natural evolution for Risktec."

Being part of TRG not only extends Risktec's geographical reach, but also strengthens our risk and safety resource pool, and broadens the range of services available to clients in areas such as asset integrity, functional safety, security and quality management.

This latest issue of RISKworld spotlights a wide range of topics, from highly numerical QRA for multi-facility complexes, through to the increasing recognition of the critical importance of safety leadership and human factors. As many organisations face the challenge of an ageing workforce, we look at how to harness graduate training and development programmes. We also review the evolution of safety cases over the years. It is sobering to note that in many cases it has taken major accidents and subsequent regulatory changes to drive positive changes in safety.

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Chronic Unease

The hidden ingredient in successful safety leadership?

Leaders working in high hazard industries are faced with a difficult personal challenge: how do you avoid complacency about major accidents such as a nuclear release, oil spill or train derailment, when such events rarely happen? How do you not 'forget to be afraid'?

The importance of avoiding complacency when it comes to industrial safety risks has long been recognised, particularly in High Reliability Organisations (e.g. Ref. 1). One term that is now being used by the oil and gas industry to describe this important state of mind is 'chronic unease'. This term actually appeared earlier in the literature than other related terms such as mindfulness, restless mind or safety imagination, when Professor James Reason introduced it as a 'wariness' towards risks as far back as 1997 (Ref. 2).

So what is chronic unease?

Put simply, chronic unease is the opposite of complacency. It is a healthy scepticism about what you see and do. It is about enquiry and probing deeper, really understanding the risks and exposures and not just assuming that because systems are in place everything will be fine. It is not just believing in what you see or what you hear or what the statistics tell you. It is about resetting your tolerance to risk and responding accordingly and continually questioning whether what you do is enough.

The thought process of a leader therefore changes from "We haven't had an incident, we are doing so well," to "Is there anything we're overlooking and what else do we need to do?"

Attributes of chronic unease

A recent research paper defines chronic unease as a state of psychological strain in which an individual experiences discomfort and concern about the control of risks (Ref. 3). That is, chronic unease is not driven by a concern about risks per se, but rather about the way these risks are managed and controlled.

The paper identifies five attributes as the principal psychological components of this state of mind, see Box 1. The extent and likelihood of a leader to experience unease depend on these attributes.

The origin of unease starts with the leader's perception of risks, which will be influenced by his or her vigilance and experience. Evaluating the degree of threat inherent in the risks is then determined by the individual's personality characteristics, especially the propensity to worry, pessimism and the ability to imagine worst-case scenarios.

When leaders use chronic unease in their work it enables them to:

- Think flexibly
- Not jump to conclusions ("think slow")
- Encourage employees to speak up
- Listen to others
- Be receptive to bad news
- Show safety commitment

Box 1 - Five attributes of chronic unease

Vigilance: Being alert to weak indicators of risks like near misses, process upsets and localised failures.

Propensity to worry: An emotional tendency to worry about risk and safety.

Pessimism: A personal tendency to resist complacency and anticipate failure.

Requisite imagination: Ability to imagine and visualise possible worst-case scenarios.

Flexible thinking: Ability to question assumptions, considering many aspects of a problem and not jumping to conclusions.

The new world

So what will the world look like when we have created a sense of chronic unease which replaces complacency? (Ref. 4).

Leaders will ask the right questions. They will be keen to know what vulnerabilities exist. Safety specialists will respond in clear terms, which anyone can understand and relate to. Operators will understand their role in safety management and will be encouraged to speak about their real safety concerns, without fear of repercussions.

Leaders will actively seek information which tells them where attention needs to be paid to address the vulnerabilities. There will be a positive desire to learn from others and to share knowledge and experience, so that lessons do not have to be re-learned time and time again in different organisations. Collaboration and information sharing will replace unhelpful turf protection.

Corporate lawyers would also be challenged to help leaders communicate and share, rather than stand in the way of sharing and learning. Systems safety knowledge and competence will be recognised as fundamental for all leaders within the major hazards industries.

What's the downside?

Chronic unease might raise (in hindsight) unnecessary concerns, and it might slow decision-making processes. But this should be weighed against the impact of not taking action or making poor decisions – a major accident.

Conclusion

Research indicates that chronic unease is a desirable state for leaders at all levels in relation to the control of risks. When leaders are using chronic unease they will have developed a culture where they are alert to even the weakest signals of potential failure, and make effective and timely interventions.

References

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Regulatory Reform: Empowering the Safety Case

Forty years ago in the UK, the Health and Safety at Work Act (HSAWA) was introduced to replace the patchwork quilt of prescriptive safety regulations with a regulatory regime that set broad, non-prescriptive goals. Espousing consultation and engagement, the new regime was designed to deliver a proportionate, targeted and risk-based approach, underpinned by a fundamental principle: 'those that create risk are best placed to manage it'.

Box 1 - Core Principles of a Safety Case Regime

1. Operator is responsible for safety, including formal demonstration
2. Continuous implementation of measures to reduce risk to levels that are As Low As Reasonably Practicable (ALARP)
3. Sets safety goals that are adaptable, embodying continuous improvement
4. Active stakeholder participation in safety management process
5. Operational feedback and safety indicators are used to drive improvements
6. Proportionate, targeted and risk-based independent assessment, verification and audit of safety management system and safety critical elements
7. Independent, competent and fully funded regulatory authority

Legacy of accidents

Whilst the HSAWA does not require a 'safety case', its fundamental principles are the foundation for the modern safety case regime (see Box 1). At that time, the concept of a 'safety case' already existed in the UK nuclear industry, stemming from the Nuclear Installations Act (1965). However, it took the Flixborough and Seveso incidents in 1974 and 1976, and the resultant EU Directive and legislation on the Control of Major Accident Hazards (COMAH), before the 'safety case' regime was more universally adopted for major hazards in the UK and Europe.

Since then, although different terminology is used in different industries and locations, the 'safety case' regime has been progressively adopted in many countries across high hazard industries, albeit often provoked by high-profile accidents, such as Chernobyl (1986), Piper Alpha (1988), Exxon Valdez (1989), Texas City Refinery (2005) and Deepwater Horizon (2010).

Even in the US, where regulation is still predominantly prescriptive, there are examples. Most recently, in their review of the Chevron Refinery fire in Richmond, 2012, the US Chemical Safety Board (CSB) recommended that California adopt a 'safety case' regime for petroleum refineries.

In Europe, the emphasis is now on applying safety case principles to emerging technologies, such as offshore wind farms, while harmonising risk assessment methods across more established industries. For example, since July 2012, any significant changes to major European railway systems have to be assessed using the so-called Common Safety Method.

Moving target

The scope of 'safety' has also widened to encompass other factors. For instance, in the aftermath of the Deepwater Horizon oil spill, the EU sought a common standard for both offshore health and safety and environmental protection. The final EU Directive advocates a proportionate risk-based approach. Unsurprisingly, the North Sea offshore industry is simply incorporating environmental protection into their existing safety cases.

Returning to the UK's nuclear industry and new build in particular, the Office for Nuclear Regulation (ONR) now expects a safety case that encompasses security in the same way as other threats to nuclear safety.

Conclusion

Modern safety cases are adaptable, proportionate and risk-based, with operators firmly responsible for safety. Although it takes many guises, this simple concept is now at the heart of many regulatory regimes across the globe, with the common aim of preventing major accidents.

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By Degrees – Making a graduate programme work for you

Graduate training schemes are common in most large organisations and can be a good way to attract talent and provide a basic grounding in the business.

Traditional graduate training schemes typically last one or two years, and involve rotation through a number of departments within the business. In each, the graduate is introduced to operations, following a structured training plan, often shadowing experienced colleagues, before moving on to the next department. Whilst this broad understanding of the business can be beneficial to a future career, the graduate emerges from the scheme with limited practical experience and may be ill-equipped to make a meaningful contribution to the business for some time. Moreover, many graduates can become frustrated or disillusioned by constant work-shadowing, fuelling the risk of dropping out.

Harnessing potential

Many companies underestimate the capabilities of graduates and assume tacitly that, until they have completed the graduate training scheme and have gained experience, they are of limited benefit to the business. However, given the right opportunity and a degree of freedom, graduates can make a contribution to the business in a way that established employees cannot.

Graduates have one significant advantage over long-standing employees: their lack of preconceived ideas means that they will ask simple questions that could challenge the basis of accepted working practices. By focusing on a needy area of the business and harnessing the enthusiasm of a small team of graduates, it is possible to deliver tangible benefits.

Some organisations foster a natural reluctance to embark on such an endeavour in the belief that it will create more work downstream – but this barrier evaporates if the graduates are also empowered to implement agreed solutions. And if a structured training scheme is operated in parallel, the graduates will emerge fully trained, with a thorough understanding of a critical business area and significant practical experience (see Box 1).

Success factors

Key requirements for this type of scheme are:

- Graduate selection is fundamental; although academic grades are important, the graduate should have drive, enthusiasm, and strong interpersonal and influencing skills.
- An area of business should be identified that is ripe for improvement and relevant to graduate development.
- The graduate team should be free from outside distractions, i.e. the team must be "ring-fenced".
- Strong leadership and support should be given to the graduates, whilst giving them the freedom to identify improvements, propose solutions and implement agreed changes.
- Structured training should be carried out in parallel, with an integrated training schedule that aligns with the tasks being undertaken.

Box 1 – Case study: Risktec graduate development scheme

Working with a major client on an identified area of business improvement, Risktec recruited a number of hand-picked graduate teams.

Graduate selection involved initial screening by interview followed by assessment centre evaluation, designed to identify graduates with excellent interpersonal and influencing skills, and proactive working methods.

The graduate teams were "ring-fenced" to concentrate on improvements in equipment reliability and maintenance regime.

The graduates were overseen by the client but given the freedom to troubleshoot problems, propose and investigate potential solutions, and ultimately implement changes.

Strong management support from the client ensured that the graduate teams were given a high profile and the results of their work communicated throughout the business.

All graduates were enrolled on the Risktec Risk and Safety Management MSc, with the course tailored in content and timing to support task delivery.

Significant business benefits were achieved through the introduction of modern and often novel techniques, coupled with more streamlined scheduling and a reduction in high-frequency low-value maintenance tasks. Moreover, the talent pool was widened, by producing graduates with practical site experience and postgraduate qualifications.

Conclusion

Graduates have huge untapped potential. Rather than being an initial burden on an organisation, they can be an asset in their own right if harnessed intelligently and given the freedom to think for themselves.

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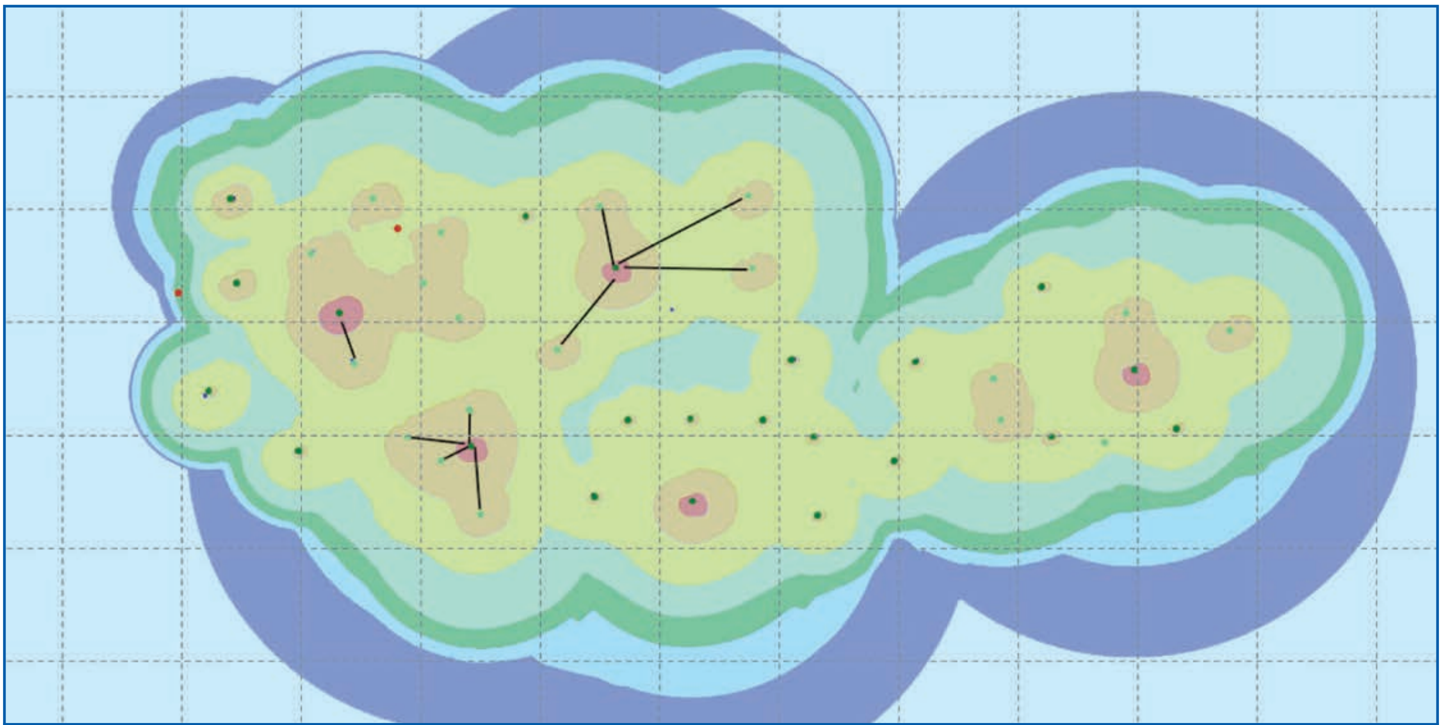
Quantitative Assessment of Multi-Facility Risks



An example of risk contours for a multi-facility site

Operators of major hazard facilities are required to understand and manage the risks presented to their workforce, the general public and the environment. Complications can arise when multiple facilities are located in close proximity, as each will contribute to the risks at neighbouring facilities.

In some cases, such as large industrial cities in the Middle East, a large number of hydrocarbon processing facilities are co-located in the same super-complex. City-wide risks are important in such situations for land-use planning, determining sites suitable for further process facilities or for worker camps.

For offshore developments of extensive oil and gas fields, there may be multiple platform hubs with drilling centres and processing trains, each with significant hazard ranges. Field-wide risks are important when assessing separation distances and scheduling construction teams, particularly in fields where the highly toxic hydrogen sulphide is present.

So how can we assess city or field-wide risks for a multi-facility development?

Single QRA model solution

The natural solution is to develop a conventional quantitative risk assessment (QRA) model to cover the whole complex or field. This approach can present many technical challenges. Although each facility will usually already have its own QRA, these may have been developed with different rule sets and assumptions, so a process of rule set alignment with relevant stakeholders would be required initially. The QRAs may also have been developed in different custom or commercial software packages, further complicating the integration process.

The size of the final QRA model also needs to be considered, as a direct combination of individual facility QRAs could lead to a large and cumbersome model, taking significant computational power to process - or even exceed the limitations of the software. A screening process to remove events with no potential for off-site impact would be required to mitigate this, on the understanding that ensuing results should only be used to analyse off-site impact. Nonetheless, it follows that developing an over-arching QRA model can involve substantial effort.

Alternative solution

An alternate approach to consider before committing to an integrated model is to explore ways of exploiting the results of the existing QRAs. Bringing these together in a faster (albeit coarser) fashion has several advantages and can give useful results in a fraction of the time. One example is the use of the data behind the contour plots traditionally generated in onshore QRAs. Most QRA packages are able to export the underlying risk data generated from the model on a regular grid of points across a geographical area. These individual risk outputs can be combined on a common site-wide grid using simple translation and interpolation operations to produce risk contours spanning the full site.

As there are no risk calculations being performed, there is no dependence on specialist QRA packages and processing is fast. The relative locations of facilities can be quickly updated, with changes to the risk profile visualised almost instantly without long simulation times, giving a real benefit in situations where a multitude of potential layouts are being assessed. In this case, although the detailed contribution from specific events is lost, the overall benefits are realised for a fraction of the cost of an integrated QRA.

Conclusion

Developing QRAs spanning multiple major hazard facilities can be a challenging and time-consuming process. Coarser results-based strategies have the potential to short-cut this, allowing city or field-wide risk profiles to be generated in a much shorter timescale.

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Human Factors Engineering in the Oil and Gas Sector

Introduction

Twenty six years ago, the Piper Alpha disaster served as a 'wake up' call to the offshore oil and gas sector. Serious failings in the safety management system led to a condensate pump being started in error without overpressure protection (which was blanked temporarily for maintenance), directly causing the subsequent explosion.

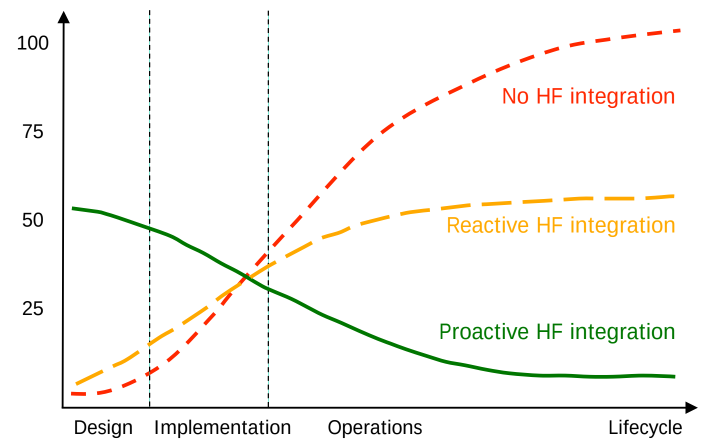
Whilst progress has undoubtedly been made in recognising the role of Human Factors (HF) in the intervening years, recent incidents such as Deepwater Horizon demonstrate that there is still work to be done.

The discipline of Human Factors Engineering (HFE) entails the application of HF knowledge and principles to the design and operation of socio-technical systems. The objective of HFE is to "ensure systems are designed in a way that optimises the human contribution to production and minimises potential for design-induced risks to health, personnel or process safety or environmental performance" (Ref. 1).

Benefits of HFE

There is increasingly a need to ensure consideration of HFE in order to meet regulatory requirements. For example, for the UK North Sea, the HSE's Assessment Principles for Offshore Safety Cases (Ref. 2) make specific reference to the need to take account of HF to manage major accident hazards, whilst in the Norwegian Sector the NORSOK Standard on 'Working Environment' (Ref. 3) includes detailed requirements for HFE.

In addition to reducing the risk of major accidents, application of HFE is essential for minimising occupational safety risks and ensuring the health and wellbeing of the offshore workforce, which in turn reduces downtime. Application of HFE principles can also improve operational efficiency and maintainability, for example by streamlining tasks, optimising workloads and ergonomic design. With the huge costs associated with even short interruptions to operations, this alone should be a major driver for consideration of HFE.



Cost of detecting and resolving HF issues

An Integrated Approach

Despite the obvious and numerous benefits of applying HFE, to date the discipline has still not been given the recognition and level of commitment it requires within the sector.

Too often, HFE support is requested too late in response to an identified problem, incident or regulatory pressure.

The solution and key message is to ensure that HFE is an integrated part of the project lifecycle, from concept design to operations. As such, HF involvement may be warranted in a range of activities, including screening of skid package designs, valve criticality analysis and 3D model reviews.

This is underlined by the International Association of Oil & Gas Producers (OGP), which has recognised the lack of HFE input within the industry and has issued guidance on recommended good practice in applying HFE in projects (Ref. 1).

Skills shortage

A number of major oil and gas companies have developed or are developing standards for HFE integration, and this practice needs to become more widespread. One of the key factors governing the successful update of HFE is the need to appoint a suitably qualified person to lead the HFE integration process.

This is one of the main challenges for industry, as there are simply not enough experienced HF engineers currently working in the sector (see Box 1).

Conclusion

There is a general consensus in the oil and gas sector that HFE can make a significant contribution to reducing and controlling major accident and occupational safety risks, as well as improving operational efficiency; but this can only happen if there are enough skilled human factors engineers. The industry therefore needs to look both inwards (via training) and to other sectors to address this gap.

Box 1 – Options for plugging the HF skills gap

- Recruiting HF specialists from other industries (e.g. nuclear, transport, space)
- Retraining existing staff
- Recruiting graduates and providing training (see page 4)

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