RISKworld

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In This Issue

Welcome to Issue 21 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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Contents

Risktec

Risktec + Astec = Solution!

Last year was one of continued growth and new developments, and we are very pleased to welcome the Astec Group of companies to Risktec. Astec has a strong track record of providing specialist technical resources to supplement and extend the capability of client organisations. These services complement Risktec's consulting and training & education services extremely well. As a result, Risktec now offers a more complete and flexible solution to clients, encompassing technical work packages, embedded support, training courses and educational programmes.

Our new office in Crawley strengthens our capability in the south of England, continuing our philosophy of establishing operations close to our clients.

Internationally, our first distance learning postgraduate programme is well underway with participants from seven countries worldwide. The next programme is scheduled to commence in June.

We also recently established a RISKworld group on the professional networking platform LinkedIn, with the aim of creating a forum for risk and safety professionals to exchange views on topical issues. We would welcome your participation and feedback. Visit www.linkedin.com or follow the link on our website.

This edition of RISKworld presents a number of topical articles which we hope you will find interesting and stimulating. The articles on 'black swans' and 'stress testing' focus on rare events which can have major impacts nationally and internationally. We also have a look at the safety of emerging energy technologies and explore the benefits of computer technology for permit-to-work systems and training delivery.

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Black Swan or Blind Spot? The Duality of Extreme Events

A black swan is characterised by Nassim Nicholas Taleb [Ref. 1] as an event which:

1. Is a surprise (to the observer), an 'extreme outlier'
2. Has a major impact
3. Is rationalised by hindsight, as if it could have been expected

The phrase 'black swan' was a common expression in 16th century London as a statement of impossibility, on the presumption that all swans must be white because all historical records of swans reported that they had white feathers. But black swans were then discovered in Western Australia in 1697.

The phrase today is often rolled-out when there is a crisis, such as a major industrial accident, natural disaster or corporate financial collapse. But is this always strictly correct? For example, was the Fukushima nuclear accident a black swan?

Swans were assumed to be always white, until the discovery of black swans in Australia. Rare, unexpected but highly significant events are much more common than we think.

Fukushima – a black swan?

On the 11th March 2011, having survived a powerful Magnitude 9 earthquake (the largest recorded in Japanese history), the reactors at the Fukushima Daiichi nuclear power plant were shut down safely only to be compromised by the 14-15m tsunami that hit the site about one hour later, leading to core meltdown. But how does the Fukushima accident score against Taleb's three criteria?

The Japanese tsunami strikes the turbine building of the Fukushima Daiichi nuclear power plant

1. Surprise? No

At up to 15m in height the tsunami was larger than the 'design basis event' of 3.1m, but over the last 100 years Japan's east coast has suffered a number of large tsunami (>10m) associated with earthquakes; with more than one locally over 15m.

2. Major impact? Yes

While no site workers or members of the public were killed by the nuclear release, an exclusion zone of 20km radius still exists around the reactor site and 100,000 people were displaced from their homes. Germany, Italy and Switzerland declared their intention to halt current nuclear programmes. The site is no longer operational, leaving a long-term shortfall in electricity generation of around 2% of Japan's needs. In the short-term, nearly all of Japan's nuclear power plants were unavailable whilst safety reviews were being undertaken, with a loss of 30% of the country's electricity generation.

3. Rationalised? Yes

The International Atomic Energy Agency (IAEA) identified that design basis tsunami for the Fukushima site underestimated the hazard, based on the accepted methods and the available data [Ref. 2]. The assumption that the site would definitely stay 'dry' (rather than be flooded) was not demonstrated, and represented a 'cliff edge' in terms of consequences.

A series of 'Stress Tests' have subsequently been performed on all reactor sites across Europe, examining scenarios significantly beyond their design basis to determine the response to extreme events and identify if there is a 'cliff edge'. No fundamental weaknesses have been found.

Or blind spot?

Assessing other industrial major accident events against these three criteria similarly shows that while they tend to have an extreme impact and are rationalised by hindsight, they are rarely a surprise. Rather, they are actually organisational 'blind spots'.

A recent study of 18 high profile corporate crises [Ref. 3], which included the Texas City explosion and the Buncefield fire of 2005, as well as the Great Heck, Hatfield and Potters Bar rail accidents of 2000-2002, concluded that 'Board risk blindness' was one of 7 underlying causes of these crises. This blindness manifests itself in various ways (see Box 1).

The study concluded that several developments are necessary to address these risks effectively, including the need for boards to recognise the importance of risks that are not identified by current approaches, as well as focus on how to ensure missing risks are captured.

Conclusion

Many industrial major accidents are colloquially described as black swans, when in fact they were entirely foreseeable and preventable if it were not for organisational blindness. While shining light on those risks that are hard to see is not necessarily simple, a good place to start is to foster a culture that has a 'collective mindfulness' of such risks.

References

1. The Black Swan, Nassim Nicholas Taleb, 2010.
2. Report on IAEA International Fact Finding Expert Mission of Fukushima NPP Accident Following Great East Japan Earthquake and Tsunami, 2011.
3. Roads to Ruin, AIRMIC, 2011.

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Box 1 - Board risk blindness

- Not focusing on 'licence to operate' risks (Railtrack)
- Not setting and controlling risk appetite (Texas City)
- Failing to appreciate risks presented by complexity, especially mergers and acquisitions (BP merger with Amoco)
- Failing to create an effective process safety culture (Buncefield, Railtrack, Texas City)
- Defective flow of important information (Texas City failing to absorb lessons from previous incidents at Grangemouth refinery)

Know Your Breaking Point
The Benefits of Organisational Stress Testing

Introduction

The term 'Stress Testing' has featured in the headlines over the past few years as authorities respond to the worldwide banking crisis and, more recently, the Fukushima nuclear power plant incident. Banks or operators of nuclear facilities have been required, or encouraged, to undertake 'Stress Tests' to assess the ability of their organisation to withstand extreme conditions. In both cases, stress testing was reactive, in that it was initiated after crises had occurred, and was intended to assess the resilience of similar organisations (see Box 1).

In tensile testing, samples are deliberately tested to destruction to characterise a material's ultimate strength. This principle is scaled up for 'stress testing'.

Box 1 - What is stress testing?

Stress testing is a general term for any assessment used to determine the capability of a given system, or organisation, to withstand conditions beyond normal operations or accident conditions for which specific provision has been made. In its simplest form, a component, system or company is tested to breaking point to establish the weakest link, the outcome of the failure and identify if strengthening measures are required.

Stress testing has been around for a considerable time. It is extensively employed for the testing of critical software and hardware that is required to have high reliability and be fault tolerant, for use in industries such as telecommunications and banking.

Naturally, the financial sector's stress tests focus on business resilience, whilst the nuclear industry's focus is very much on the safety of people.

Common characteristics

Although quite different in focus, stress tests in the financial and nuclear sectors have some common characteristics:

- They are implemented after an actual event has brought an issue into public scrutiny and attracted the attention of politicians and regulators.
- They are initiated by an actual event, but are not intended to be restricted to this event.
- To be effective they require organisations to be open minded when conducting the assessment.
- They assess the ability of an organisation to respond to, and manage a major incident.
- They improve understanding, but don't reduce risk until changes (physical or procedural) are successfully implemented.

Avoiding stress

High profile incidents invariably lead many boards of companies operating in hazardous sectors to consider the exposure of their organisation. Indeed, some companies have started initiatives to assess critically their organisation's exposure and resilience to "Major Accident Events". This goes beyond regulatory requirements (which concentrate mainly on safety and environmental risk) and examines the potential financial and reputational impact. A variety of approaches can be adopted, depending on the nature and scale of the organisation, but will typically comprise desktop reviews, workshops, qualitative and/or quantitative assessment and facility based audits.

Low frequency, high impact events should be identified and assessed in all highly regulated industries. Indeed some regulators require the potential for 'cliff edges'[1] to be examined. However, in practice, these rare events can be difficult to deal with and demonstrate convincingly that risks are tolerable and ALARP.

Major incidents are regrettable, and no doubt with the benefit of hindsight, are avoidable. However, it is important that the lessons learned from major incidents are well understood, shared across industries and changes implemented in an effort to prevent re-occurrences.

Conclusion

Proactive organisations are starting to utilise a stress test approach to assess their operations "beyond regulation", while considering the potential wider impact on their business. This helps improve the understanding of the organisation's resilience, and informs the identification of practical risk reduction measures, while demonstrating a commitment to safe and sustainable operations.

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Note 1: A small change that leads to a disproportionate increase in risk.

Emerging Energy Technologies

Can they be implemented safely?

Concerns over greenhouse gas emissions, energy security and escalating costs have combined to catalyse a move towards a new energy economy. In the future, the technologies meeting our electricity, heating and fuel needs must deliver against three key criteria: sustainability, security and affordability. Over the next decade and beyond, a wide range of emerging energy technologies (EETs) are likely to play an important role in reshaping the energy economy (see Figure 1).

Energy Feedstocks	Power/Fuel Generation	Distribution/ Storage
Unconventional gas	Coal gasification Hydrogen Fuel Cells & Turbines	
Biomass crops Biomass imports Agricultural slurries Food wastes/Municipal & Industrial wastes	Anaerobic Digesters Biomass Incinerators Gasification/Pyrolysis Biofuels Production Combined Heat & Power Workplace micro-generation	Hydrogen Distribution & Storage CO2 Transmission, Storage & Sequestration
Wind, Wave, Tidal, Geothermal, Solar, Hydropower	Onshore/Offshore Wind Turbines Wave & Total Power Solar Thermal & PV	
Hydrogen	Carbon Capture	

Figure 1 – Overview of Emerging Energy Technologies [Ref.1]

Managing risk

EETs are not without risk. They all present occupational hazards, most present hazards to the public and some will present major hazards – the potential for multiple fatalities and/or widespread damage to property and the environment as a result of a single incident. Figure 2 presents an overview of the UK Health & Safety Executive's view of the risks of key EETs [Ref. 1].

The contribution these EETs make to the ultimate success of this new energy economy will depend on their ability to be harnessed safely.

Risk management principles and techniques honed over many years in other more mature industries can be applied. However, this is not always straightforward. By their very nature, EETs are novel and hence not necessarily well understood. Uncertainty may surround the nature and extent of hazards and limited, if any, safety data may be available to support risk assessment. Research and testing is still ongoing and many EETs have yet to be proven on a serious scale anywhere in the world.

Wider issues

Possibly the greatest threats to the safe implementation of EETs lie not in the engineering, but in the generic symptoms of this new energy economy:

- In such a fast moving, competitive environment there is a significant risk that experience and best practice is not shared.
- The rapid expansion of EETs is likely to present a significant skills gap.
- New companies may struggle to establish an adequate health and safety culture quickly.
- The trend for such projects to be funded via complex consortia or 'virtual companies' can mean ambiguous health and safety ownership.
- Commercial pressure to be 'first to market' may result in health and safety issues being deferred to a later stage, foreclosing on options to reduce risk.

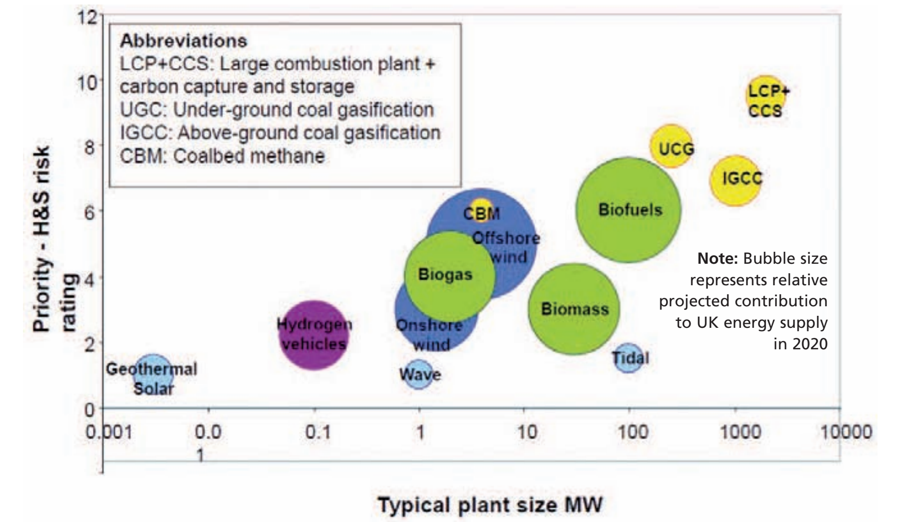

Figure 2 – Health & Safety Risks in EETs

Meeting the challenge

These are big challenges, which will need researchers, designers, and financiers to adopt a long-term focus on achieving the societal benefits of a reformed energy economy. This will entail collaborating effectively, sharing knowledge and experience and lesson learning. Moreover, a pragmatic yet robust risk management process must somehow be embedded into the entire life-cycle. Only time will tell whether industry can deliver on this vision.

References

1. Offshore Wind Logistics, January 2011, A regulatory update from the HSE's EETs programme

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e-Learning – The Future of Cost-Effective Training and Education?

What are the benefits?

With the continual advances in IT, software-based training and education (more commonly referred to as e-learning) is fast offering a cost-effective and flexible alternative to traditional face-to-face learning. Whether via a simple PowerPoint slide show or an interactive online learning experience using a variety of media, e-learning offers a range of benefits:

- Once developed the online training module can be used many times with minimal delivery costs.
- Students can learn at their own pace, repeating parts of the training as necessary to ensure effective learning.
- Training can be undertaken during or outside normal working hours and by students in different time zones, with consistent training ensured.
- Different training pathways to the same content can deliver the flexibility to cover in-depth or refresher training, or provide an overview for managers or supervisors.
- Competence assessments can readily be built in to check learning, whether voluntary or mandatory in nature, which can be used to unlock subsequent content.
- Competence record keeping can be automated.

Box 1 - e-Learning solutions

Training need #1 – Nuclear safety procedures.

Solution – Suite of web-based training modules, with interactive examples and animated features.

Training need #2 – Distance learning MSc in safety and risk management.

Solution – Web-based training modules, with powerpoint slide shows, wikigroup discussions, activities, interactive online teaching sessions and the submission of assignments.

Road map to e-learning

The development of an effective online training and education tool to meet an organisation's specific training needs typically requires a small production team of specialists in the subject area, teaching and IT development. The process essentially comprises three phases:

Requirements capture

This involves the establishment of the training needs, key learning outcomes or areas of focus, source material, target duration, accessibility options and competence assessment requirements. This is best undertaken in an open forum involving the end user and the production team to capture the authoring, teaching and implementation experience.

Storyboard development

This phase starts with the definition of the structure and progression of the module, which is then expanded to outline each 'packet' of technical content and its delivery concept. This necessitates clear technical knowledge and understanding together with a creative slant to devise novel, interactive, eye-catching and (perhaps most importantly) informative and memorable means of conveying the content.

Production

Once defined, the storyboard is developed into a fully fledged online module. This will include the development of graphical themes (colour schemes, fonts, logos, menu styles etc) through to the nuts and bolts of the interface design and content population. Box 1 describes two real examples from high hazard industries.

Conclusion

In a world where more is expected of individuals and organisations, with budgetary pressures continually increasing, e-learning may offer a viable alternative to traditional training.

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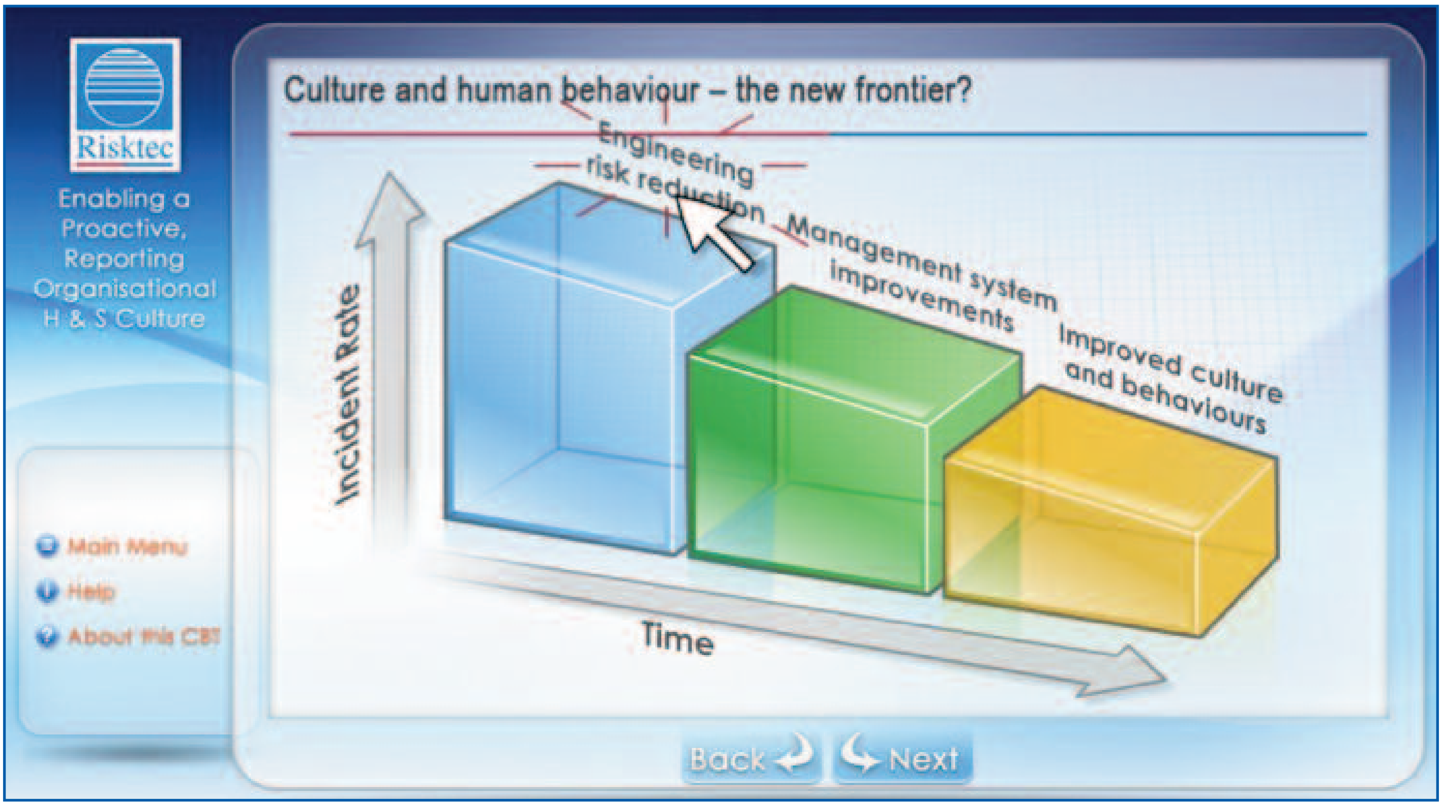

An Introduction to Electronic Permit to Work Systems

Introduction

A Permit to Work (PTW) system provides a formal documented system to control potentially hazardous activities, and is an integral part of a safe system of work.

Historically, PTW systems have been paper-based. However, new technologies, such as e-Permits or Integrated Safe Systems of Work, are playing an ever increasing role in assisting organisations to achieve effective management of hazards, and delivering a step change in safety performance.

e-PTW systems ultimately produce a piece of paper akin to conventional PTW systems. But if the end result is the same, what is the difference? Do electronic systems simply offer a neater way to produce and store the same information? 'Certainly not' should be the answer, but in practice, careful consideration and selection of the e-PTW system is required if improvements are to be realised.

e-Efficiency and e-Safety

All e-PTW systems claim that their principal benefits fall into three categories:

- Productivity gains
- Risk reduction
- Management control

The key to gains in efficiency compared to paper-based systems is the intelligent process that precedes the output of a permit. This ensures that the correct category of PTW is raised (e.g. for hotwork), together with any supporting certificates and links to supporting information. A properly designed e-PTW system will also have the necessary 'authorisation gates' built into the software, and will identify any associated mandatory controls (e.g. fire watcher).

Like paper-based systems, the best e-PTW systems are risk-based, adopting risk assessment as the fundamental driver. This makes sense given that their purpose is to provide an effective means of managing the risk associated with hazardous activities. However, with e-PTW systems, it is easier to apply a consistent approach to risk assessments, which can be archived and called upon again, reviewed, updated and then re-issued as required.

In the same way, some e-PTW systems can often manage any equipment and system isolations that might need to be in place to protect the workforce during maintenance activities.

e-PTW systems can also present accurate and up-to-date management information by means of a 'graphical planner', which can highlight potential conflicts in the proposed timing of activities that should not be undertaken concurrently.

Another big advantage of e-PTW systems is their power to share information, together with its ease of access and visibility. This, along with automated communication features such as notifying people who need to be involved and providing a rapid route to the information they need to see, is a major benefit for work control (see Box 1).

Lastly, usability should not be overlooked. A good PTW system should be simple to operate. It is clearly important that e-PTW systems do not deliver their benefits at the expense of usability.

One size doesn't fit all

As many organisations have learnt in recent years, what suits one site and work control regime does not necessarily suit another.

Ultimately, the decision to invest in an e-PTW system should follow the same logic as investing in a computerised financial management system. In principle, it should be much more efficient and effective as a management tool, but only if properly specified and implemented…and whatever system is adopted, it will only be as good as the users.

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Box 1 - PermitVision

Using web-based technology, The PermitVision software allows PTW forms to be monitored and issued from any location, on and offshore. This allows control centres to gain a real-time update on all work being done, anywhere, anytime.

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