

The Price and Complications of Safety Compliance – an Australian Perspective

Corina Glavan^{*a}, Ekambaram Palaneeswaran^b

^aThales Australia, Armaments, Mulwala, NSW 2647, Australia

^bSwinburne University of Technology, Faculty of Engineering and Industrial Science, Victoria 3122, Australia
corina.glavan@thalesgroup.com.au

The high cost of major hazard facility (MHF) accidents, in terms of loss of lives, serious injuries, loss of production and associated cost of reputation and legal costs, require major hazard facilities to operate in a regulated regime designed to control major accidents. The Australian goal-setting regulatory regime is characterised by fragmentation in terms of jurisdiction, administration, reporting of near misses and classification of MHFs. Implementation of MHF regulation falls to the control of State and Federal jurisdictions, leading to some inconsistency in interpretations, as well as the additional complexity of process and high cost of developing Safety Case documentation. Specifically, this expansive rework on compliance activities impacts on all national/ international concerns that have operations in multiple states and thereby consequential exposure to higher expenses and competitive disadvantages. The discussions in this paper include: a basic comparison of MHF regulatory framework applied in different Australian jurisdictions and the impact of proposed harmonisation of Australian OHS legislation on reducing the risk of major accidents at MHFs.

1. Cost of Major Accidents

In general, accidents are triggered by the shortcomings in various internal and external factors such as governance, regulations, profit, manufacturing practices and organisational management. These factors influence and shape the organisational culture which sets that path for error-producing factors (Hopkins 2000) with significant negative consequences in terms of loss of life, cost of damages and wide spread impact. Accidents are a reminder that in hazardous industries the consequences of plant process failures are not just serious but can be truly catastrophic if not adequately controlled. Although human lives are invaluable and non-quantifiable, some econometric measures such as “value of statistical life” attempt to quantify for specific purposes including cost-benefit analyses and costs of accidents (ASCC, 2008; Blaeij et al., 2003). For example, as per Australian Government Department of Finance and Deregulation’s Office of Best Practice Regulation estimate (OPBR, 2008), the value of statistical life is A \$3.5 million and the value of statistical life year is A\$ 151,000.

1.1 Gas Explosion at the Kleen Energy Plant, Middletown Connecticut

In February 2010 a combined-cycle gas fired power plant experienced a catastrophic gas explosion. The accident occurred during the planned cleaning of fuel gas piping that was part of the commissioning and start-up phase of the power plant that resulted in six fatalities, 50 reported injuries and significant damage to the \$1bn project (Wilson et al., 2010). The accident was preventable if an inert gas had been used for cleaning and purging (US CSB, 2010).

1.2 Oil Spill, Deepwater Horizon

On April 20, 2010, BP and its contractors were cementing the well's steel casing after having drilled the Macondo oil well in the Gulf of Mexico to its final depth. A dangerous build-up of methane gas in the well rose to the surface, causing an explosion and fire that sank the drilling rig and killed 11 people (Flournoy, 2011). Following the explosion, oil spilled into the Gulf of Mexico resulting in the largest ecological disaster known to the US. In a recent estimate (Robertson, 2010), $4.99 \cdot 10^6$ barrels of oil were released from the well into the Gulf. In addition to the spill clean-up costs, more than a hundred thousand claims had been submitted to BP (Perry, 2011). Under the US Clean Water Act 1990 BP could be fined up to \$4,300 for every barrel spilled in addition to the loss of royalties for the oil it is squandering (Dickson, 2010). The on-going CSB investigation is examining the adequacy of controls, organisational and human factors (US CSB, 2011).

1.3 Conflagration, Buncefield, UK

In December 2005 a series of explosions produced a major conflagration at a fuel storage depot that engulfed 23 large fuel storage tanks over a high proportion of the Buncefield site. Over 40 people were injured; fortunately there were no fatalities. It was estimated that 2,000 residents had to be evacuated and 16,500 people employed by the nearby businesses had been affected (UK HSE, 2008) by the fire. The overall cost of the incident including claims for individuals and businesses, investigations, emergency response and clean-up was estimated to be just below £1 billion (UK HSE, 2008). The report on the Buncefield fire reminded of the failure to understand major risks, a failure to provide adequate focus, resources or expertise to maintain safety critical barriers and a failure to respond to warning signs (Hackitt, 2011).

1.4 Fire, ESSO Longford Gas Plant, Victoria, Australia

In September 1998 a major accident at the ESSO gas plant paralysed the state economy for three weeks. The accident, in which two people died and eight were seriously injured, cost the Victorian economy more than A\$ 1 billion. The Longford Royal Commission (LRC, 1999) determined that "*The failure to conduct a HAZOP study or to carry out any other adequate procedures for the identification of hazards [] contributed to the occurrence of the explosion and fire*" in addition to the breach of the Victorian Occupational Health and Safety (OHS) Act.

Legislation was developed or amended to include lessons learned from major accidents such as the inclusion of the ALARP concept and the Safety Case Regime following the Piper Alpha major accident, the inclusion of Land Planning for MHFs following the Buncefield conflagration, or the implementation of MHF legislation in Victoria and the Safety Case regime following the Longford accident (Glavan et al., 2010). The Safety Case is prepared by the MHF operator in support to demonstrate safe operation. The Safety Report is assessed by the regulator, or its approved assessor.

2. Overview of MHF Regulatory Regime in Australia

Australian MHFs are defined as workplaces such as a chemical plants, oil refineries, and other manufacturing and transport depots, where quantities of certain hazardous or dangerous substances exceed threshold quantities and have the potential to seriously harm people, property or the environment in the event of an accident. Around two hundred workplaces in Australia are considered to be MHFs (NOHSC, 2002).

Australian MHF legislation is a goal-setting legislation which requires that the risk of major accidents needs to be reduced to a level that is *As Low As Reasonably Practicable* (ALARP). ALARP involves both concepts of "reason" and "practicality" to bridge the gap between technological and societal views on risk (Bluff and Johnston, 2004). ALARP has two connotations; a legal one and a practical one. In legal terms ALARP describes the level of expectation to demonstrate that risks are controlled in the workplace. Practically, it involves weighing a risk against the effort, time and cost needed to control the risk against the benefit gained from risk reduction. Factors considered in determining what constitutes "*Reasonably Practicable*" are: the quantum of risk and the likelihood of risk, which are weighted against cost, time and effort. Factors considered in determining "*Practicable*" are severity of hazard or risk and state of knowledge about hazard or risk. These are compared against: the knowledge about ways of

removing or mitigating hazard or risk, the availability and suitability of ways to mitigate or remove risk and the cost of removing or mitigating risk.

The Australian MHF legislation was initially developed in 1991 by the National Occupational Health and Safety Commission (NOHSC, 1994) with the national uniform objective to prevent major accidents and to minimise the effects of any major accidents resulting from the MHF operation. The *National Standard Control of Major Hazard Facilities* and the *National Code of Practice* were shaped by international documents such as the ILP Convention 174 and the Seveso Directive (NOHSC, 1994).

Although maintained by the Australian Safety and Compensation Council (ASCC) the MHF legislation was implemented and enforced by each of the eight jurisdiction representing the Australian States and Territories. In Victoria MHF legislation was enacted in 2000, but implementation of legislation in other states was delayed until 2008 (CPR, 2008) because of the lack of resources and low priority allocated for the development of MHF legislation. Facilities in Australian coastal waters are regulated under a separate framework by the National Offshore Petroleum Safety Authority (NOPSA).

A lack of uniformity in the implementation of MHF legislation created inconsistencies and specific issues of concern for owners and operators of MHFs, specifically regarding the adoption of legislation, terminology, focus and cost (ASCC, 2004; CPR, 2008; NOHSC, 2002):

- (a) *Inconsistency in Adoption* leading to significant difference between jurisdictions in what constitutes an MHF and the scope of the regulations: MHF operators require a licence in VIC, WA and the Commonwealth, but not in NSW, QLD and NT where they require either classification or registration. The Safety Case in some jurisdictions is only required to address health and safety issues, while in others it must also address environmental or land use planning issues, thus impacting on the cost associated with the development and on the complexity of the Safety Case. Security of MHFs is addressed differently in different jurisdictions, with the New South Wales jurisdiction being more prescriptive in security requirements than other legislations.
- (b) *Different Lead Agencies* (Table 1) – Victoria, NSW and Commonwealth use OHS legislation and OHS lead regulator to regulate MHF legislation. NT and SA use dangerous goods legislation and/or other state departments, complicating the assessment process and changing the focus of the legislation.
- (c) *Differences in Classification* – An inconsistency in adopting a uniform MHF classification system meant that different agencies adopted different systems of MHF classification. Under Comcare and VIC regulations, a site automatically is classified as MHF if it exceeds the threshold of schedule materials, while the NSW, QLD and WA regulations apply discretionary provisions to the classification of facilities that contain between 10 to 100 % of the aggregate quantity ratio or if they have the potential for a major accident even for non-schedule materials.
- (d) *Complexity and cost* – Delays in implementation triggered complex processes for the development of Safety Case, specifically affecting national companies that operate in different jurisdictions. Operators in jurisdictions that impose MHF controls are exposed to competitive disadvantage, as they incur the compliance costs that their competitors may avoid by choosing to locate in regulation-free jurisdictions. Meanwhile, delays in legislation implementation resulted in uncertainty that deferred investment in safety-related infrastructure until the compliance requirements have become known for MHF operators.
- (e) *Assessment Fee* – licensing fees are charged in some jurisdictions but not in others. Commonwealth and QLD do not recover costs of assessing MHFs. The cost of licensing could vary 10 times between jurisdictions.
- (f) *Lack of Reporting* – Although MHFs are required by law to report accidents and near-misses, these are not made public, except in Victoria. The Victorian regulator (WorkSafe Vic) reported the detail of 13 serious occurrences in the period 2006 – 2010. The lack of an accident database affects the ability to prevent similar occurrences by learning valuable lessons. Currently, accidents and near misses are reported by press, while “commercial in confidence” clauses prevent regulators from disclosing information about these serious occurrences.

The inconsistency in legislation becomes a challenging exercise for an MHF operator with facilities located in different Australian states. For example, a facility located in Victoria is expected to pay

A\$ 56,560 for a 5-year license, while the cost of license in NSW is A\$ 440,000. If the facility is operating in Queensland it is not required to pay an assessment fee. An even more challenging situation occurs for multiple MHFs located nearby, when one facility may be regulated by Commonwealth's Comcare while the other(s) by NSW WorkCover, each jurisdiction with their understanding regarding classification. This could result in a potential escalation of a major accident from one MHF to another due to the lack of complexity of the Safety Case and its inability to understand potential release mechanisms of hazardous energies.

Table 1: Administration and Enforcement of MHF Legislation (various sources were accessed)

Jurisdiction/ Year	Legislation	Lead regulators/ agency	MHFs
Commonwealth 2005	<i>OHS Act 1991 & OHS Regulations 1994</i>	Comcare	40
New South Wales (NSW) 2007	<i>OHS Act 2000 & OHS Regulations 2008</i>	NSW WorkCover Authority	32
Victoria (VIC) 2000	<i>OHS Act 2004 & OHS Regulations 2007</i>	WorkSafe Victoria	41
Queensland (QLD) 2002	<i>DG Safety Mgmt. Act 2001 and DG Safety Mgmt Regulations 2001</i>	Department of Emergency Services	32
Western Australia (WA) 2005	<i>DG Safety Management Act 2004 and DG Safety Mgmt. Regulations 2007</i>	Resources Safety Petroleum and MHF Safety	26
Tasmania (TAS) 2009	<i>Dangerous Substances Act 2005 and Dangerous Substances Regulations</i>	WorkPlace Standards Tasmania	na
South Australia (SA) 2006	<i>Dangerous Substances & MHF Bill</i>	WorkCover SA	1
Northern Territory (NT) 2009	<i>Workplace Health and Safety Act Workplace Health & Safety Regulations, Dangerous Goods Act, DG Regulations</i>	NT WorkSafe	5
Australian coastal waters 2005	<i>Petroleum Submerged Lands Act 1967 Petroleum Submerged Lands Regulations 1996</i>	National Offshore Petroleum Safety Authority (NOPSA)	164

3. Impact of Proposed Harmonisation

Since 2001 Australian governments have recognised the advantages of implementing a consistent National Standard and National Code. In July 2008, the Council of Australian Governments (COAG) signed an agreement for regulatory and operational reform in occupational health and safety, committing the state, territory and Commonwealth governments to implementing nationally uniform OHS legislation with consistent approaches to enforcement and compliance (COAG, 2008). The Model Work Health and Safety (WHS) Act was endorsed in 2009 but harmonisation will be achieved when each State and Territory will enact their own legislation that mirrors the Model WHS legislation (Access Economics, 2009). Changes in the Model WHS legislation are expected to impact on the following key areas:

- It broadens the duty of care provisions beyond the traditional employer/employee relationship so that all persons who conduct a business or undertaking will owe a duty of care to all persons who may be put at risk from the conduct of the business or undertaking

- It incorporates the principle and application of risk management process in support of regulation
- Provides for significant penalties in OHS legislation, above and beyond current penalties applied in any Australian jurisdiction, as well as imprisonment for most serious breaches to ensure a meaningful deterrent and encourage greater levels of compliance
- Confers powers to authorised union representatives to enter workplaces for OHS purposes

In early December 2011 the implementation of harmonised OHS legislation continues to divide the states; Federal, Northern Territory, New South Wales and Queensland Governments are ready to implement the national harmonised WHS laws on 1 January 2012, South Australia deferred debate on its WHS Act until February 2012 and Tasmania voted to delay the implementation by 12 months. Victoria and Western Australia failed to enact the harmonised legislation (SIA, 2011).

4. Discussion and Conclusion

The MHF legislation has proven to be resilient and effective across a range of hazardous industries, even in the absence of a dedicated integrated database. Despite the differences in interpretations and level of maturity, the Australian goal-setting legislation replaced much of the prescriptive – rules-based, industry-specific regulations, allowing MHF operators to set their own goals and provided them with flexibility and judgment in deciding whether a risk is ALARP. This acknowledged the fact the operators of MHFs who create the risk in the first place are allowed to manage that risk. In practice, this means that a significant duty of reducing or controlling the risks for major accidents is placed on the operators rather than the regulators.

The forthcoming implementation of harmonised OHS legislation, which also covers the prevention of major accidents at MHFs, is based on principles which require MHFs to focus on lead instead of lag indicators. Measurement of lead indicators performance within the facility is a key element in monitoring process safety, measuring the signs that things are not going as expected and being able to take action before accident occurrences. The harmonized legislation places the honors and the responsibility on senior managers who need to better understand the nature of the processes under their control. Presumably, the main deficiency of legislation is that it encourages insular operation of MHFs. Confidentiality clauses do not allow facilities to share their knowledge base of dangerous occurrences with other MHFs, and as such it isolates facilities from one another. There is a greater need in Australia to develop an integrated and sharable accident database and a reporting tool for both the regulators and the operators of MHFs to pass information on past accidents as a means of future accident prevention.

In addition to rationalizing the complexity of safe operations and normalising licensing costs, the harmonized OHS legislation provides the MHF owners and operators with an opportunity to change their operating philosophy from a position that ‘nothing unexpected or unplanned is about to happen because we comply with MHF legislation’ to the one based on preparedness and ability to quickly react to unusual events before they had the chance to materialise in major accidents. The harmonized OHS legislation fosters conditions for better understanding of risk and a greater commitment to building inherent safety into plant design, operation, control and management. Hazardous plants will continue to operate with the same or similar equipment but the harmonized OHS legislation provides an opportunity to improve the ways in which these plants operate, integrating process safety in everyone's role, as described in the Model WHS legislation. MHF owners and operators would need to place greater importance on improving the process of writing operating procedures, in the way employers and contractors are trained, way in which they are engaged in consultation and encouraged to report unusual events and how managers respond to their concerns.

References

- Access Economics, 2009, *Decision Regulation Impact Statement for a Model Work Health and Safety Act*, report by Access Economics for Safe Work Australia, <www.safeworkaustralia.gov.au/>, Accessed 01.12.2011
- ASCC (Australian Safety and Compensation Council), Australian Government, 2004, *Major Hazard Facilities, Annual Situation Report*, <www.safeworkaustralia.gov.au>, Accessed 01.12.2011
- ASCC (Australian Safety and Compensation Council), Australian Government, 2008, *The Health of Nations: The Value of a Statistical Life*, <www.safeworkaustralia.gov.au>, Accessed 01.12.2011

- COAG (Council of Australian Governments) 2008, *Intergovernmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety*, <www.coag.gov.au> Accessed 01.12.2011.
- CPR (Chemicals and Plastic Regulations) 2008, Productivity Commission Research Report <www.pc.gov.au> Accessed 01.12.2011.
- Blaeij A., Florax R.J.G.M., Rietveld P., Verhoef E., 2003, The value of statistical life in road safety: a meta analysis, *Accident Analysis & Prevention*, 35, 973-986.
- Bluff L., Johnstone R. 2004, The Relationship Between 'Reasonably Practicable' and Risk Management Regulation, National OH&SRC, Working Paper 27, <regnet.anu.edu.au/sites/default/files/u86/WorkingPaper_27.pdf>, Accessed 07.05.2012.
- Culter J., 2011. NOPSAs - Building on the Past, Planning for the Future, presentation, APPEA National Oil and Gas Safety Conference, <www.nopsa.gov.au/presentation> Accessed 01.12.2011.
- Dickson T. 2010, The Spill, the Scandal and the President, *Rolling Stone*, 8 June 2010, <reality-my-view.com/The_Spill_The_Scandal_and_The_President.pdf> Accessed 01.12.2011.
- Flournoy A. 2011, Three Meta-Lessons Government and Industry Should Learn from the BP Deepwater Horizon Disaster and Why They Will Not, *Boston College Environmental Affairs Law Review*, 281, <litigation-essentials.lexisnexis.com> Accessed 01.12.2011.
- Glavan C., Palaneeswaran E. 2010, Towards effective management of major hazards facilities, *Proceedings of CHEMECA 2010 Conference*, Adelaide, Australia, ISBN 978 085 825 9713.
- Hackitt J., 2011. Applying effective leadership and enhancing competency improvement in hazardous industries. Speech. Melbourne, Australia: Process Safety Event, 2 June, <www.hse.gov.uk/aboutus/speeches/transcripts/hackitt020611.htm> Accessed 01.12.2011.
- Hopkins, A., 2000. Lessons from Longford: the Esso gas plant explosion, CCH Australia Limited, Sydney, Australia.
- Longford Royal Commission (LRC) 1999, The Esso Longford gas plant accident: Report of the Longford Royal Commission, Parliament of Victoria, Melbourne, Australia, p. 235.
- Newton J. 2008, The final report of the Major Incident Investigation Board, Buncefield Major Incident Investigation Board, The Office of Public Sector Information, Surrey, UK.
- NOHSC (National Occupational Health and Safety Commission) 1994, National Code of Practice for the Control of Workplace Hazardous Substances, Canberra, Australia.
- NOHSC 2002, Major Hazard Facilities — Annual Situation Report 2002, <www.ascc.gov.au> Accessed 05.06.2010.
- OHS (*Occupational Health and Safety Act, 1991*), Office of Legislative Drafting and Publishing, Attorney-General's Department, Canberra, Australia, <www.comlaw.gov.au> Accessed 20.06.2010.
- OPBR (Office of Best Practice Regulation), 2008, Best Practice Regulation Guidance Note – Value of Statistical Life, Australian Government, Department of Finance and Deregulation, Canberra, Australia.
- Perry R., 2011. The Deepwater Horizon Oil Spill and the Limits of Civil Liability, *Washington Law Review*, <www.ssrn.com/abstract=1685963> Accessed 01.12.2011.
- Robertson C., 2010. U.S. Puts Oil Spill Total at Nearly 5 Million Barrels, *N.Y. Times*, Aug. 2, 2010, <www.nytimes.com/2010/08/03/us/03flow.html> Accessed 01.12.2011.
- Safe Work Australia, 2010. Summary of the Model Work Health and Safety Act, <www.safeworkaustralia.gov.au>, Accessed 01.12.2011.
- SIA (Safety Institute of Australia), 2011, Mixed Fortunes for OHS Harmonisation, SIA Newsletter, <www.sia.org.au/newsletter>, Accessed 01.12.2011.
- UK HSE (Health and Safety Executive), 2008. Report and recommendations arising from the Competent Authority's response to the Buncefield incident, <www.hse.gov.uk/comah/buncefield>, Accessed 06.16.2010.
- US CSB (Chemical Safety and Hazard Investigations Board), 2010, Urgent Recommendations from Kleen Energy Investigation, <www.csb.gov/assets/document>, Accessed 01.12.2011
- US CSB 2011, Statement from U.S. Chemical Safety Board Chairman Dr. Rafael Moure-Eraso, <www.csb.gov/newsroom>, Accessed 01.12.2011.
- Wilson L., Tillema D., Holmstrom D. 2010, Discussion on Kleen Energy Incident, <www.csb.gov>, Accessed 06.08.2010.
- WorkSafe Vic, MHF Unit, <www.worksafe.vic.gov.au>, Accessed 20.11.2011.