

Buncefield response

CDOIF environmental guidance — a welcome consequence of the Buncefield disaster

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Back in 2009 I wrote a paper about learning from accidents for Hazards 21¹. In it I compared the speed at which the inquiry into the Tay Bridge disaster, in December 1879, had completed its work so it could report to Parliament within six months (in June 1880); with the delay in information coming out of the Buncefield incident — then already three and a half years prior to the conference. However, hindsight gives a somewhat different perspective. I would still contrast the speed of the two enquiries — the enquiry team for Tay Bridge was assembled and travelled to Dundee within *six days* of the incident (despite Hogmanay intervening) — but the learning from Buncefield for Process Safety (PS) practice has probably been more significant than from any other recent incident.

The investigation of most accidents, even major accidents, generally turns up a depressingly familiar set of causes — poor safety awareness, sloppy practice, poor safety analysis, etc — and they existed at Buncefield too. However the investigation of Buncefield gave us some important insights into the *practice* of PS analysis. Before Buncefield we knew that congestion could cause a burning vapour cloud to transition to detonation but PS practitioners (me included) would generally have dismissed the chance of it happening in an open area like that around the terminal, despite the trees and undergrowth. The work by Gexcon² and FABIG's technical conference on Buncefield³ showed us the gap in our understanding. Similarly, the work by the investigation board⁴ into the sharply different results of Layer of Protection Analyses (LoPAs) done by different teams⁵ has hopefully pushed us into improving our practice and getting our teams into a better state of training, understanding and LoPA performance.

That said the biggest impact was probably in the area of environmental assessment of major hazard risks. The terminal is operating again and the surrounding area largely rebuilt. But the eco-toxic runoff from the fire and firefighting has polluted underground aquifers and the effects are likely to be felt for hundreds of years, that is — it is likely to be hundreds of years before the aquifers can be used for drinking water abstraction again. The quantity of firewater overwhelmed the site defences and ran off into unprotected surrounding areas, then percolated down into the aquifers, carrying with it the chemicals (PFOS) used to produce the vital firefighting foam.

The response of the UK Regulators (principally the Environment Agency) was, quite understandably, that this must never happen again. They initially asked for complete, impermeable bunding around *and under* all storage tanks, together with tertiary containment for fire water, so that it could not escape from any similar storage depot or other installation. Very few, if any, existing sites achieved this standard. And the



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costs would have been prohibitive. How do you put down an impermeable layer underneath an existing 100,000 m³ tank? The request was greeted with horror by the CIA and the Tank Storage Association, and there were a couple of tense meetings. To the regulators' credit they understood the operators' concerns and a dialogue started which recognised that if had been possible to define "intolerable" and "broadly acceptable" frequencies for human deaths at work (in R2P2⁵) it should be possible to read these ideas across to environmental harm.

The outcome was the CDOIF (Chemical and Downstream Oil Industries Forum) guidance on the assessment of environmental accidents on major hazard sites, first published in 2013 and revised in 2016⁶. The guidance built on previous work⁷ and accepted that there was a "tolerable" frequency for environmental incidents but that that frequency would be dependant on: the size (extent) of the pollution from the incident and the material involved; the environmental importance of the flora and fauna affected; and the likely time

knowledge and competence

systems and procedures

assurance

it would take the environment to recover from the insult. This provided a "read across" from the ALARP triangle used by HSE for human accidents, to environmental incidents. The guidance provided a broadly similar way to approach both human and environmental accidents; and gave guidelines which could be used by regulators and the regulated industries alike.

The guidance and its use have been widely discussed, notably in a number of Hazards conferences⁸, but that is beyond this brief note. None the less it has provided another example of learning from accidents — even if somewhat slower than the Victorians managed! It represents a significant improvement in the way PS practitioners can approach the assessment of environmental risk. If you don't have, and use, the CDOIF guidance (free download from ref 6) in the production of your Major Hazard Safety Reports, you should.

References

1. "Learning lessons from accidents", Ken Patterson, presented at Hazards 21 2009, available at: <https://www.icheme.org/media/9645/xxi-paper-017.pdf>
2. Gexcon "Learnings from the Buncefield oil depot explosion" available at: <https://gexcon.daytwo.digital/blog/learnings-from-the-buncefield-oil-storage-depot-explosion-the-first-key-question>
3. FABIG Technical meeting 058 "The Buncefield Explosion Mechanism", 2009, priced publications available at: <https://www.fabig.com/publications-and-videos/technical-presentations-videos/technical-meeting-058/>
4. "A review of Layers of Protection Analysis (LOPA) analyses of overfill of fuel storage tanks" Colin Chambers, Jill Wilday & Shane Turner (Health and Safety Laboratory, Buxton), 2009, available at https://webarchive.nationalarchives.gov.uk/ukgwa/20220701233029mp_/https://www.hse.gov.uk/research/rrpdf/rr716.pdf
5. "Reducing risks, protecting people", HSE, 2021, available at: https://assets.publishing.service.gov.uk/media/6693ad9e49b9c0597dfafc36/IQ8.10.J_Document_9_Health_and_Safety_Executive__Reducing_risks__protecting_people__HSE_s_decision-making_process__2001.pdf
6. "CDOIF Guideline – Environmental Risk Tolerability for COMAH Establishments v2», Chemical and Downstream Oil Industries Forum, 2016 available from https://www.sepa.org.uk/media/219154/cdoif_guideline__environmental_risk_assessment_v2.pdf
7. For example: "Environmental risk criteria for accidents, EC (DGXII), Nixon W, Bottelberghs PH, Vince I et al (1995); and "Management of harm to the environment: criteria for the management of unplanned releases" DETR (1998), ISBN 0-11-753456-0
8. For example (amongst many others): "Learning from Application of the CDOIF Environmental Risk Assessment Method to Major Accident Hazard Plant" 2020, Marsh-Patrick A. & Dodge D (WSP UK) presented at Hazards 30 available at <https://www.icheme.org/media/25686/hazards-30-paper-17-marshpatrick.pdf>



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