LUBW

Landesanstalt für Umwelt
Baden-Württemberg

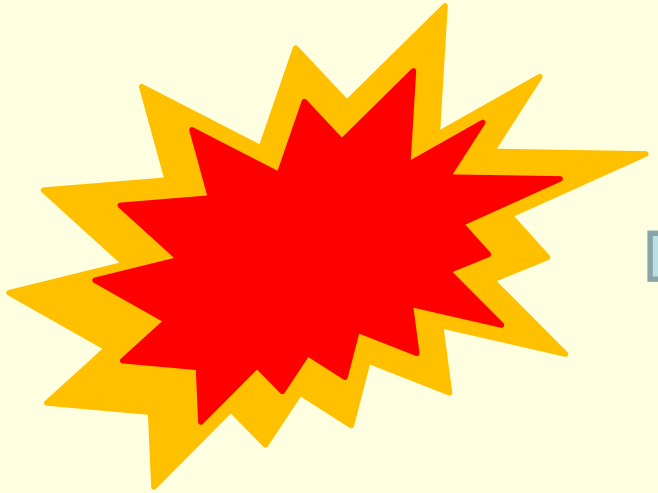
Learning from Accidents – Reporting is not enough

MARK HAILWOOD

REFERAT 33 – AIR QUALITY, AIR POLLUTION CONTROL

Baden-Württemberg

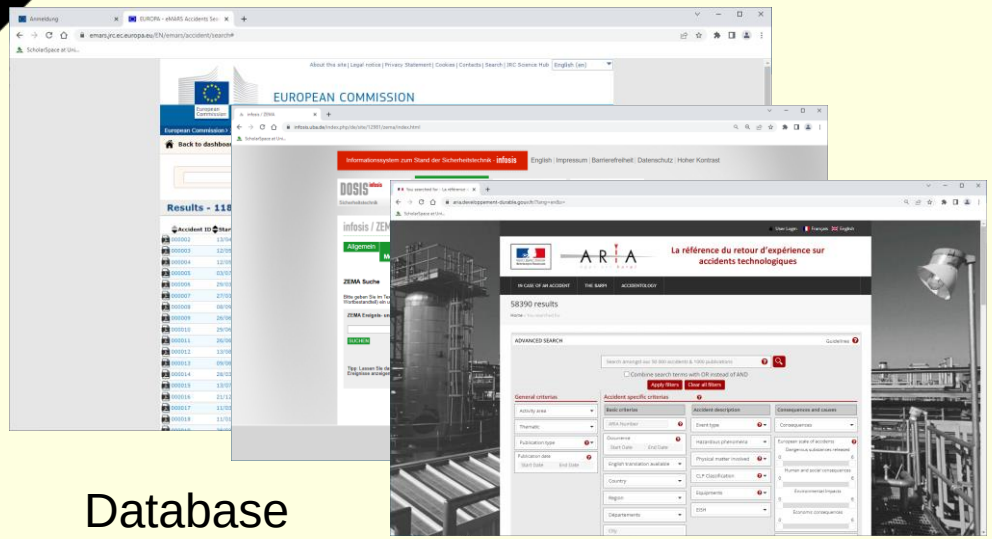
Common Practice



Accident

Investigation

Report



Database

Paper presented at Loss Prevention 2016

Hailwood M., 2016, Learning from accidents – Reporting is not enough, Chemical Engineering Transactions, 48, 709-714 DOI:10.3303/CET1648119

Wood M.H., Koutelos K., Hailwood M., Cowley C., 2022, Learning lessons from chemical incidents – What's stopping us and how we can make it happen, Chemical Engineering Transactions, 90, 685-690 DOI:10.3303/CET2290115

709

CHEMICAL ENGINEERING TRANSACTIONS
VOL. 48, 2016
A publication of AIDIC
The Italian Association of Chemical Engineering
Online at www.aidic.it/cet
Guest Editors: Eddy de Rademaeker, Peter Schmelzer
Copyright © 2016, AIDIC Servizi S.r.l.,
ISBN 978-88-95608-39-6; ISSN 2283-9216
DOI: 10.3303/CET1648119

Learning from Accidents – Reporting is not Enough

Mark Hailwood

LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg, Griesbachstr. 1, 76185 Karlsruhe, Germany
mark.hailwood@lubw.bwl.de

The fire and explosion at the Nypro Works, Flixborough, UK in 1974 led to the setting up of a court of inquiry which reported in 1975. In the closing paragraphs of the report (Department of Employment, 1975) various lessons are listed as well as issues to be referred to other bodies. Two aspects are worth highlighting, as they have to a certain extent been lost in the mists of time. Firstly, "that the management structure should be so organised that the feedback from the bottom to the top should be effective." This is not only to ensure that instructions are effectively carried out, but also that those responsible for certain tasks are competent, that top management has a clear understanding of the responsibilities and demands placed on individuals including the potential for overloading. The second issue which was raised, but referred to other bodies for urgent consideration, is that of the siting of offices, laboratories and the like well removed from hazardous plants and the construction of control rooms on block-house principles. This was then addressed further in their 2nd report to the UK's Health and Safety Commission by the Advisory Committee on Major Hazards (HSC, 1979)
On 23 March 2005 an explosion occurred at BP America's Texas City refinery killing 15 workers and injuring 170 others. All of the fatalities occurred in a temporary office container located adjacent to the ISOM-plant, but not associate with the start-up operations of this plant. The lessons learned and conclusions drawn from the various investigations regarding the location of temporary buildings as well as the feedback within the management structure bear stark similarities to those of thirty years before. The fact that the analogy between the vulnerable buildings listed in the Flixborough report and the temporary buildings for contractors had not been drawn is an indicator of the limits of the learning achieved.
This is not an isolated case, but has been repeated many fold. The chemical process world needs to make learning the lessons, i.e. taking action where appropriate, a fundamental aspect of process safety in the coming years.
This paper shows examples of the failure to learn or limits of learning achieved in the past. It raises the need to establish learning organisations not only in the chemical processing industry, but also within public authorities and academia. It confirms the requirement that learning from accidents be firmly anchored in the safety management system and that leadership and corporate governance are essential to achieving this and preventing as far as possible the disasters of the past being repeated (be it in a modified form) in the future.

1. Introduction

Learning from accidents is an essential element of chemical process safety, however when reading accident reports of recent incidents the similarity of many of the findings and also the recommendations to prevent future events to those contained in reports published several years previously is startling. It should also be a major concern to process safety specialists as it is indicative that the required learning is not taking place in a sustainable manner and that unless conscious steps are taken to address this, serious accidents and disasters are to be expected.
"It might seem to an outsider that industrial accidents occur because we do not know how to prevent them. In fact, they occur because we do not use the knowledge that is available. Organizations do not learn from the past or, rather, individuals learn but they leave the organization, taking their knowledge with them, and the organisation as a whole forgets" (Kletz, 1993).

Please cite this article as: Hailwood M., 2016, Learning from accidents – reporting is not enough, Chemical Engineering Transactions, 48, 709-714 DOI:10.3303/CET1648119

Accidents repeated

- Overfilled distillation column
  - BP Texas City, USA (2005), 15 deaths, 180+ injured, ca. 2 000 million US$ costs (compensation, fines, reconstruction, business interuption)
  - Donge, France (2018) liquid product sent to flare.
  - ….
- Overfilled storage tank and fire
  - Buncefield (Hertfordshire Oil Storage Terminal) UK (2003), explosion which measured 2.4 Richter Scale, 117 received medical treatment (28 members of the public), groundwater pollution, smoke cloud reached Spain, Costs > 1000 million GBP
  - Caribbean Petroleum Corporation, Puerto Rico (2009)
  - Jacksonville, Florida, USA (1993)
  - Naples, Italy (1985)
  - Newark, NJ, USA (1983)

Accidents repeated (2)

- H2S formation by mixing incompatible wastes.
  - Newport, UK (2001), waste acids reacted with polysulphide contaminants in waste alkalai solution, 1 dead, 3 injured
  - .Stuttgart, Germany (2005) wastes mixed in a vacuum truck, generated H_2S which was released via exhaust system, 1 killed, 5 injured.

- Fire at a surface treatment facility (electroplating)
  - Joensuu, Finland (2009)
  - Germany (2017)
  - France (2021)

Learning from Accidents
– The process and the need for improvement

- The process of learning from accidents has a series of steps:
  - Investigation
  - Reporting
  - Dissemination
  - Learning the Lessons / Instigating Learning

- The fact that accidents occur that have great similarity to past events indicate that the necessary learning is not taking place.

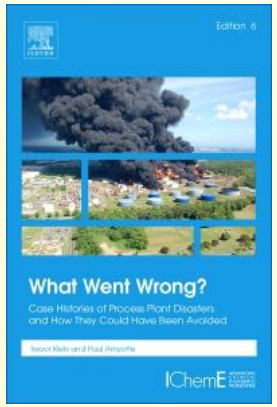
Accident Investigation

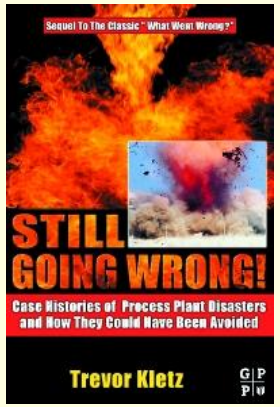
- There are numerous academic publications on accident investigation and methods, including:
  - Underwood, P., & Waterson, P. (2013). Accident analysis models and methods: guidance for safety professionals. Loughborough University. https://core.ac.uk/download/pdf/288380023.pdf
  - Sklet, S. (2004). Comparison of some selected methods for accident investigation. Journal of hazardous materials, 111(1-3), 29-37.
  - Strömgren, M., Bergqvist, A., Andersson, R., & Harms-Ringdahl, L. (2015). A process-oriented evaluation of nine accident investigation methods. *Safety Science Monitor*, *19*(1).
  - ESReDA Working Group on Accident Investigation, (2009) Guidelines for safety investigations of accidents, ISBN: 978-82-51-50309-9 https://www.esreda.org/wp-content/uploads/2021/01/ESReDA_GLSIA_Final_June_2009_For_Download.pdf

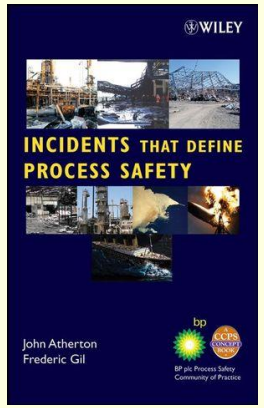
Reporting

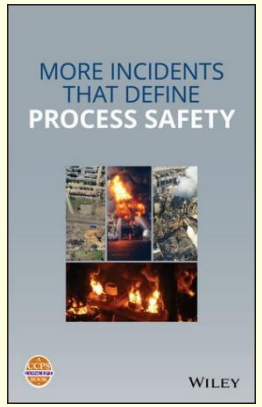
- The EU Seveso Directives have a reporting requirement:
  - Articles 16 & 17
- These reporting requirements have been implemented in the national legislation, e.g.:
  - [DE] Störfall-Verordnung, § 19
  - [FR] Code de l'environnement, Article R512-69)
  - [NL] BRZO 2015 Article 14; RRZO 2022, Article 20
- Many operating companies require their sites and installations to report (and investigate) specific types of events:
  - Fires and explosions
  - Toxic release to water, soil or air
  - Lost time injuries
  - Damage to assets or off-site damage
  - Any incident reportable to the authorities

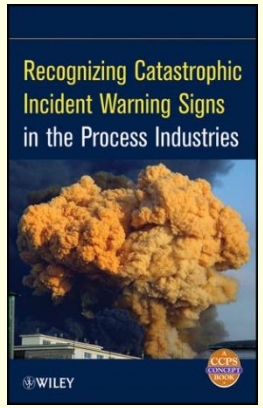
Dissemination: Books

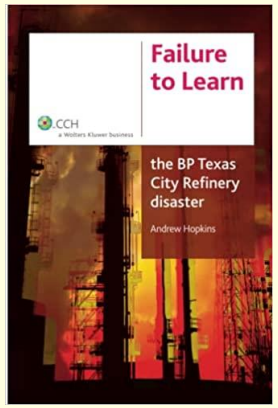


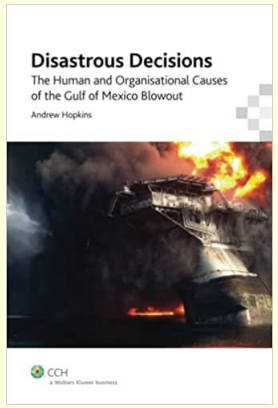


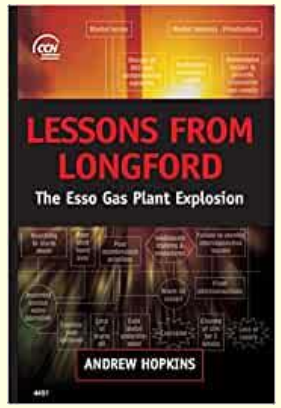


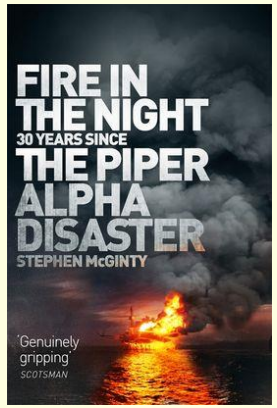


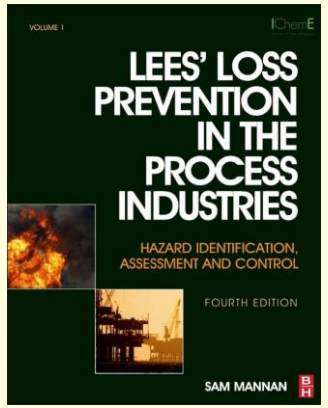




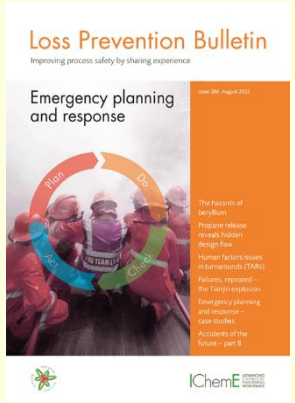


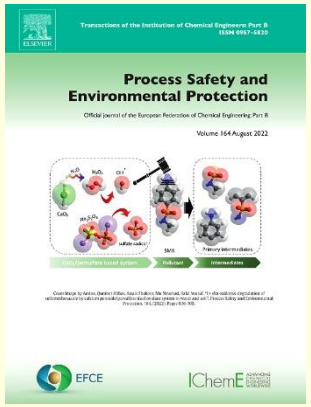


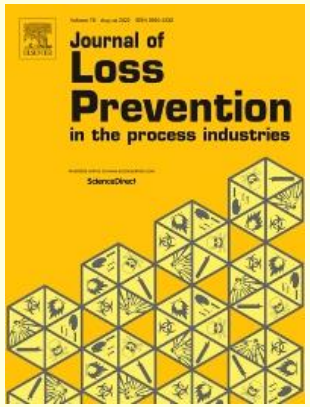


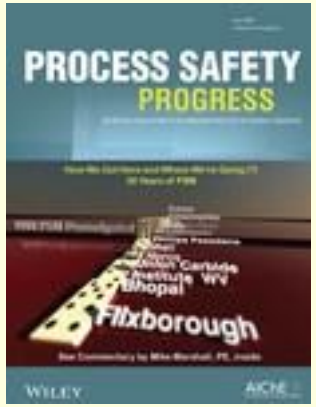


Dissemination: Journals





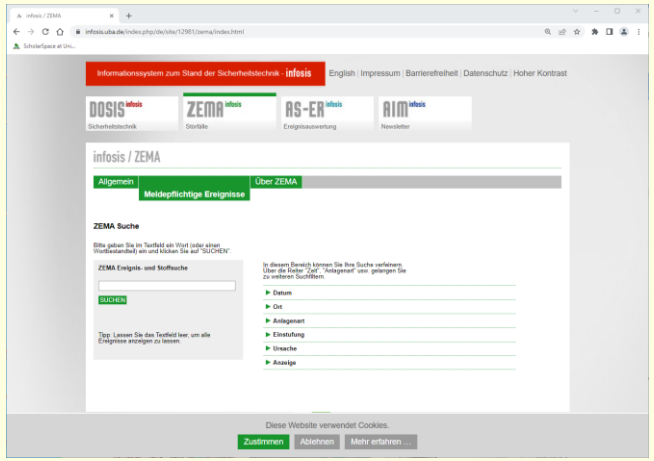




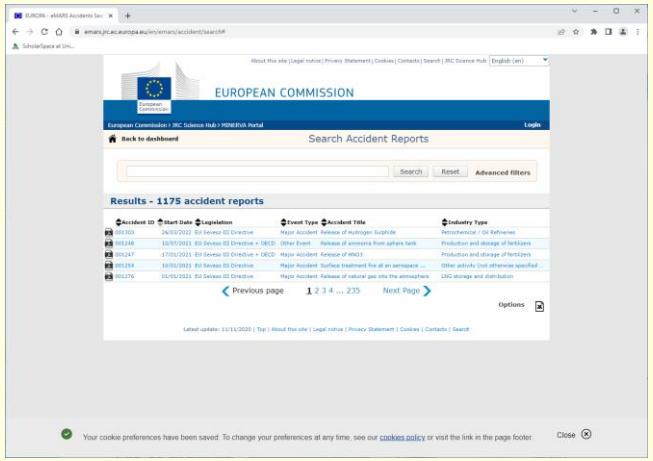
Dissemination: (Official) Investigation Reports

- US Chemical Safety Board (CSB)
  https://www.csb.gov/investigations/completed-investigations/
- UK Health and Safety Executive (HSE)
  https://www.hse.gov.uk/Comah/investigation-reports.htm
- Institution of Chemical Engineers (IChemE)
  https://knowledgehub.icheme.org/search/results/#/?q=major%20incident%20report
- Dutch Safety Board
  https://www.onderzoeksraad.nl/en/page/375/industry

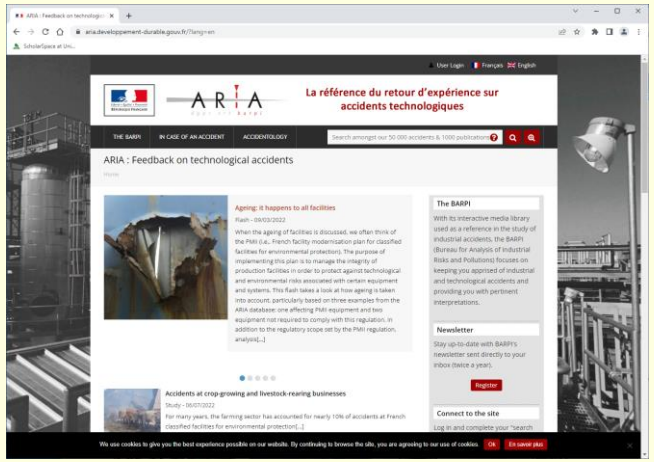
Dissemination: Databases



https://www.infosis.uba.de/index.php/de/site/12981/zema/index.html



https://emars.jrc.ec.europa.eu/en/emars/accident/search



https://www.aria.developpement-durable.gouv.fr/?lang=en

Dissemination: Short Information Sheets

https://www.aiche.org/ccps/process-safety-beacon

Safety Lore

https://www.icheme.org/knowledge/safety-centre/safety-lore/

Learning Sheets

https://epsc.be/Learning+Sheets.html

Learning the Lessons / Instigating Learning

- Learning requires change
- Changes may be needed in:
  - culture
  - organisation
  - knowledge and training
  - technology
  - procedures

Target Audience

- Industry
  - Lessons learned should help support management of risk
  - At all stages: design, risk assessment, maintenance and inspection, emergency planning

- Authorities
  - During an inspection:
    - what is the establishment doing to learn?
    - How do you know?
  - Inspection campaigns:
    - similar operations – similar risks?
  - Assessing Safety Reports