



Learning lessons from chemical incidents

– what's stopping us

– *and how we can make it happen*

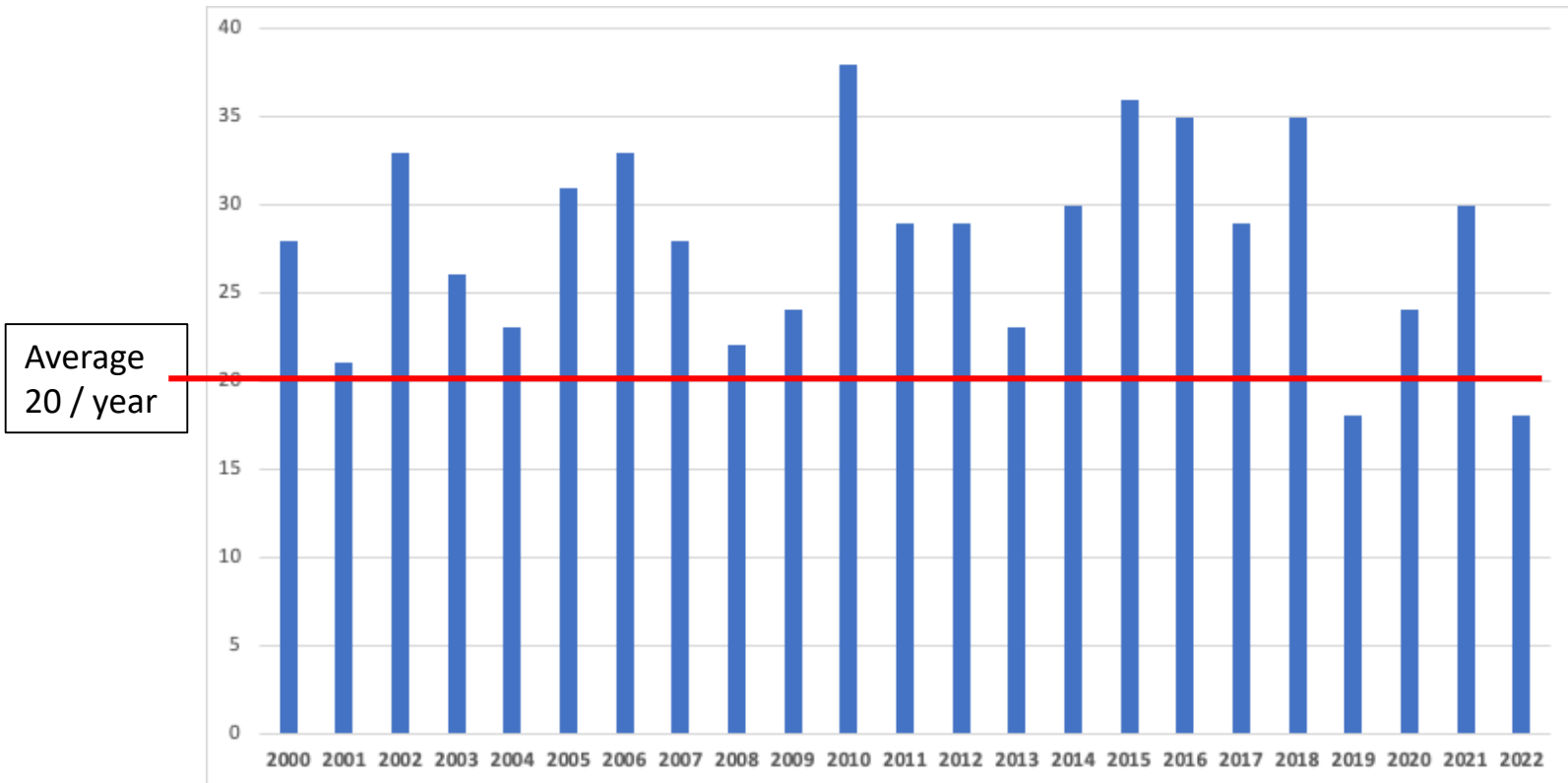
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Two decades of major chemical accidents in the EU



Extracted from European Commission eMARS database Feb 2023

Report by the Netherlands Government, 2020



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Fifteen years of incident analysis

Causes, consequences, and other
characteristics of incidents with
hazardous substances at major
hazard companies in the period
2004-2018



Appendix 5: Comparison with the conclusions of the previous long-term report (2004 – 2013)

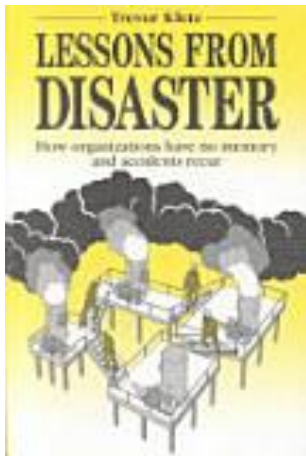
*Conclusion 2: “With regard to the causes of the
incidents, no striking trends were identified.*

Each year, the same safety functions usually fail.”

The conclusion is still valid. *Over the years, the safety
measure failures have remained more or less the same*

We are not learning

“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*”



Trevor Kletz, *Lessons from Disaster: How Organizations Have No Memory and Accidents Recur*, Gulf Publishing, 1993



No shortage of incident data



Loss Prevention Bulletin

Learn process safety
lessons without
repeating mistakes

Incident data sources listed on the EC Minerva website

	The ARIA database (in French & in English)
	ZEMA (in German)
	The U.S. Chemical Safety Board (in English)
	The International Association of Oil & Gas Producers Safety Zone (in English)
	The Japanese Failure Knowledge Database (in Japanese & English)
	Tukes VARO registry of chemical accidents in Finland (in Finnish)

Why are we not learning ?

Possible answer: Difficulties using the information stored in databases

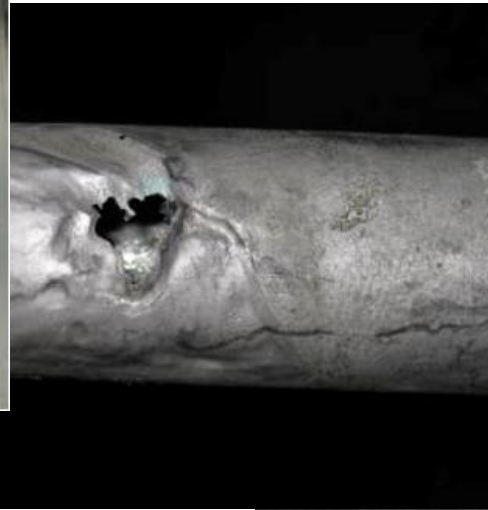
- No common classification of data
- Mostly limited to technical causes...e. g. ‘the pipe broke’



Systemic failures often not identified (e.g. supervision... competence... leadership...)

BUT...even the simplest technical lessons are routinely not implemented

.... 'the pipe keeps breaking' 😞 ☐





Why are we not learning ?

So called 'lessons learning' mainly seems to consist of reporting

Hailwood (2016) 'Learning from accidents – reporting is not enough'

Chemical Engineering Transactions, 48, 709-714



Why are we not learning ?

This question led to a three year Research Project at Cranfield University to investigate *the influence of leadership on Process Safety*

Sponsor energy
institute

- We made fieldwork visits to three large High Hazard sites in Oil & Gas / Petrochemicals
- We interviewed 73 people at the 'sharp end' of Operations and Maintenance
- We analysed 194 documents relating to 117 Process Safety Incidents

Cranfield University Research Project



SITE A

- Large petrochemicals complex in the Middle East
- **Had suffered number of major incidents**



SITE B

- Onshore oil & gas production in Asia-Pacific
- **Had suffered number of major incidents**



SITE C

- Offshore oil & gas production in Europe
- **No recent major incidents**
- **Recent award for process safety**

Cranfield University Research Project - FINDINGS

Two types of leadership

Administrative Leadership
'Command & Control'

planning, directing,
monitoring, controlling
Hierarchy

...Procedures & Compliance
...'*Work as Imagined*'

Adaptive Leadership
'Flexible'

listening, reflecting,
creating ideas, catalysing action
Supporting networks

...Mindful sensemaking
...'*Work as Done*'



PARADOX:
we need BOTH



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MAIN FINDING: need more **ADAPTIVE** leadership

1

Learning is inhibited by 'Command & Control' leadership

(Learning needs a climate of 'psychological safety' – people must feel their ideas are valued, and that they won't be blamed or ridiculed)

2

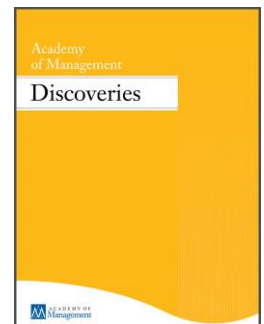
Organizational Learning needs a COMBINATION of

- reporting and reflection (**ADAPTIVE**) and
- embedding changes (**ADMINISTRATIVE**)

Paper published December 2021:

Cowley, Denyer, Kutsch and Turnbull-James 'Constructing safety: Reconciling Error Prevention and Error Management in Oil & Gas and Petrochemicals Operations' *Academy of Management Discoveries*, Vol. 7, No. 4 Dec 2021

<https://journals.aom.org/doi/abs/10.5465/amd.2019.0190>





Cranfield University Research Project

PRACTICAL IMPLICATIONS

Need to help leaders adopt more **ADAPTIVE** leadership practices to create a **LEARNING CULTURE**:

- a climate of psychological safety, so people want to report problems and share their ideas
- time, resources and expertise to identify underlying issues and improvements with real value
- **Effective ADMINISTRATIVE (leadership) practices that embed the improvements**

Also, **ADAPTIVE** leadership practices (in combination with **ADMINISTRATIVE** practices) are needed to:

- improve **INCIDENT INFORMATION MANAGEMENT**:
 - better recording of information, with **SYSTEMIC CAUSES** that go beyond single-loop learning
 - better information sharing: especially of **LESSONS** and **RECOMMENDATIONS FOR ACTION**
 - more **NETWORKS** within and between organisations to build and share expertise

How can inspectors use this? ...in assessing and improving Safety Leadership at Seveso sites

Look for evidence of **ADAPTIVE** leadership practices of leaders at all levels:

- shift team leaders, supervisors and engineers
- operations and maintenance managers
- company senior leaders

... and **nudge** companies to adopt ADAPTIVE leadership practices

Adaptive Leadership

'Flexible'...

listening, reflecting,
creating ideas, catalysing action

Supporting networks

...Mindful sensemaking

...'*Work as Done*'

Evidence of ADAPTIVE leadership may be seen, for example, in **how often, and how effectively:**

- **procedures are reviewed and revised.** (Do operators and technicians feel positively encouraged to question procedures and working practices?)
- **Process Hazard Analyses / Barrier Analyses are done.** (Are operators and technicians involved in these?)
- **safety critical task competences** are assessed. (Does the Ops/Maint Manager have up-to-date records?)
- the Asset Register of **Safety Critical Elements** is reviewed and revised. (Does this show current condition of SCEs?)
- **incident investigations are done.** (Are HiPo **Near-Miss & Potential Incidents** treated the same as **Actual Incidents**?)
- **internal audits are done.** (Are they seen as a learning opportunity?)

AND...

- **How deep / systemic** are the findings from these activities? Do they result from inclusive, reflective analysis?
- Are the resulting recommendations reviewed, agreed and **implemented swiftly**?
- Who is the driving force behind these processes – **safety specialists or senior leaders**?



How can inspectors use this? -...in assessing and improving Safety Leadership at Seveso sites

Links to some [EC JRC MAHB publications](#) - providing more details

[Assessment of Safety Management Systems of Major Hazard Sites](#) (section 2.3 Leadership...) 2010

[Safety culture, leadership and enforcement: What does it mean for Seveso inspection? \(IChemE HAZARDS XXVI - 2016\)](#)

[Learning lessons from accidents Key points and conclusions for inspectors EC JRC Technical Report 2020](#)

Seveso Inspection Series Tools - Common Inspection Criteria:

- [No. 3 Internal Auditing Procedures 2014](#)
- [No. 4 Process Hazard Analysis 2016](#)
- [No. 7 Process Safety Performance Monitoring 2018](#)
- [No. 9 Maintenance of Primary Containment Systems 2019](#)



Mulțumesc
Danke
Dakujem
Ačiū
Paldies
Dzięki
Grazie
Thank you
Grazzi
Gracias

Merci
Köszönöm
Hvala vam
Благодаря ти
Obrigado
Bedankt
Děkuji vám
Kiitos

Tack
Tak
Takk
Go raibh maith agat
Tänan
Efharistó

