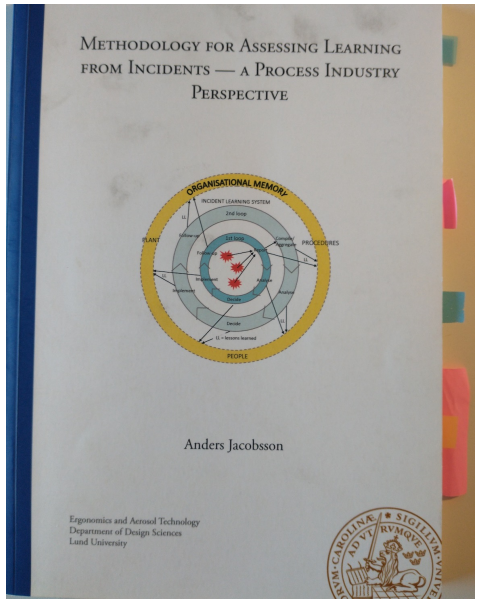
Learning from small incidents and near misses

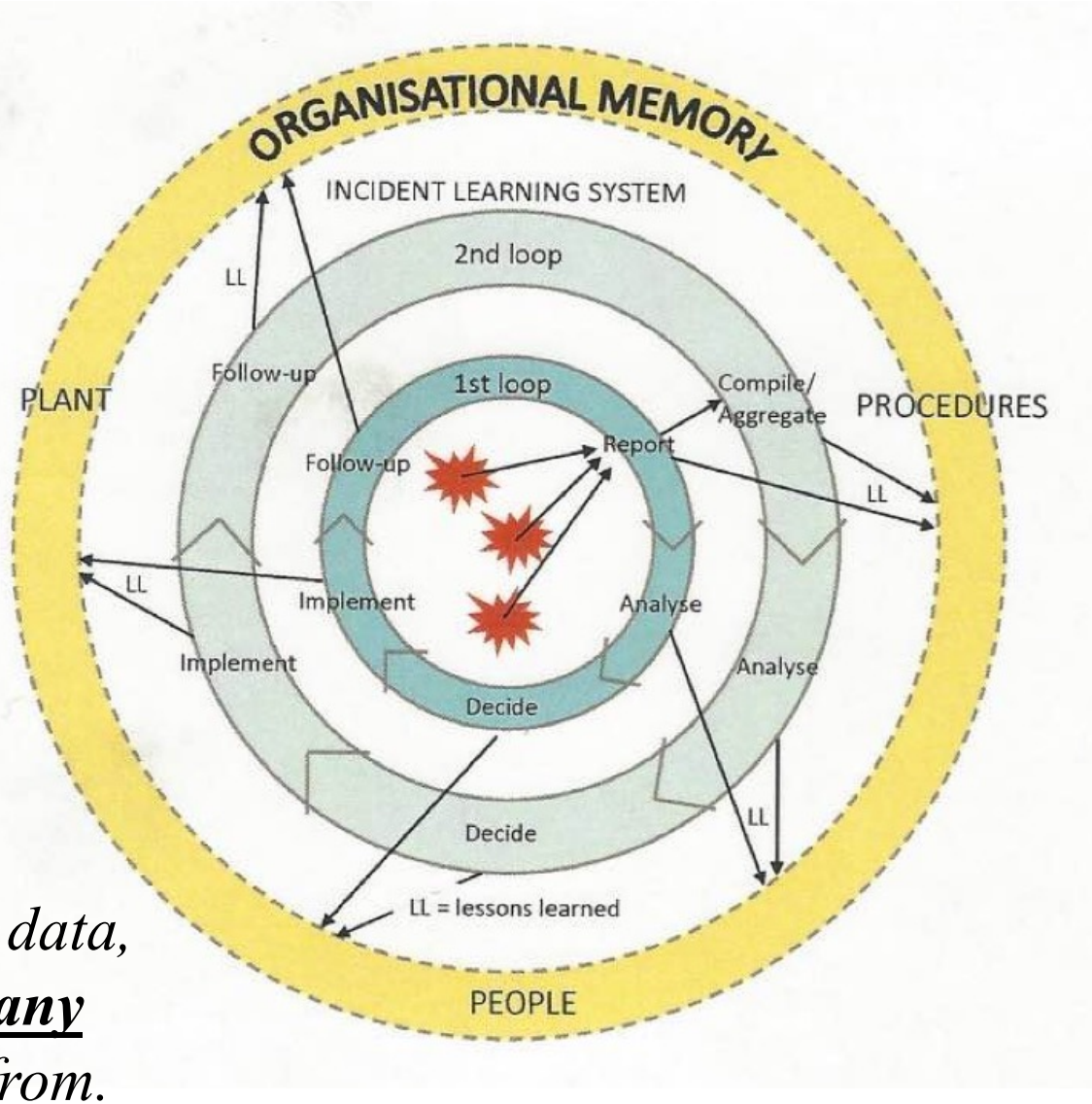
”The 2nd Loop Project”

Analysis of about 200 incidents at six IPS member companies

Mats Lindgren

The project was inspired by this man





The 2nd loop *is the analysis of accumulated incident data, in order to identify* ***common underlying causes****.* ***Many small incidents*** *can provide lots of lessons to learn from.*

The 2nd loop project - Participating IPS members

INEOS

BOREALIS

kemira

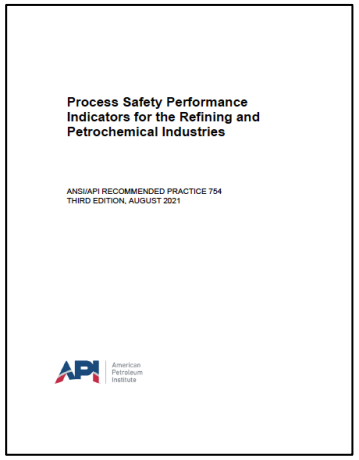
Perstorp

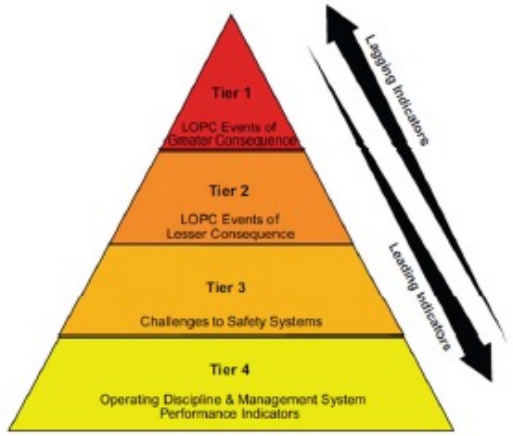
Sekab

NYNAS

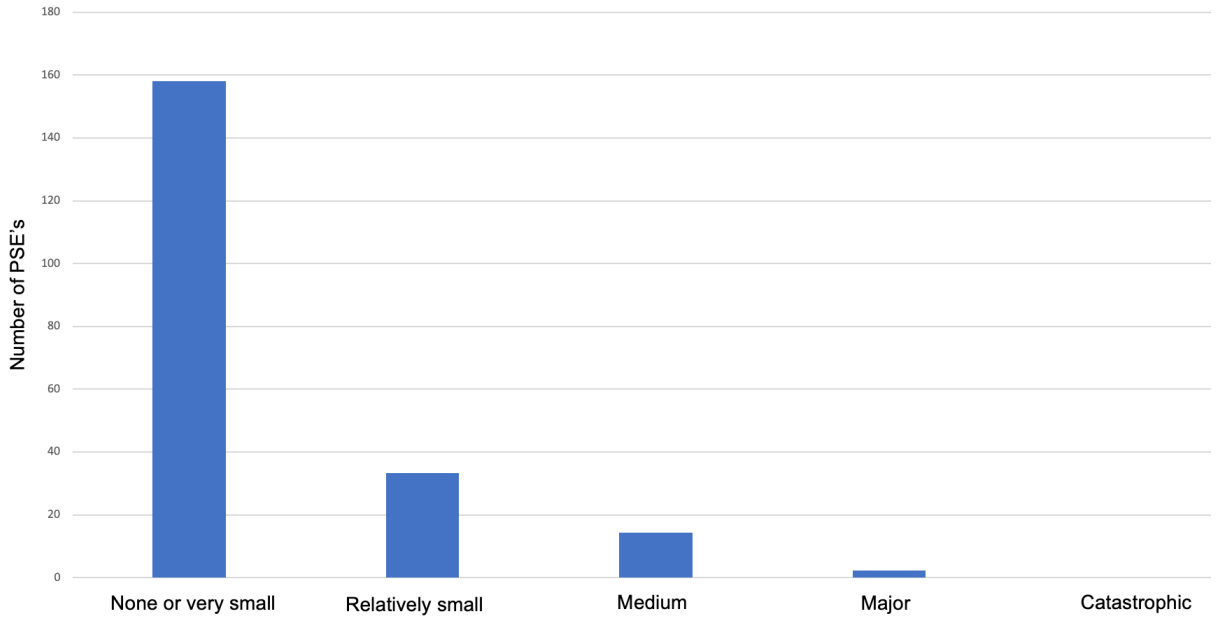
We reviewed 30 - 40 Process Safety Events at each company

- It was mainly ”small” LOPC’s and challenges to safety systems



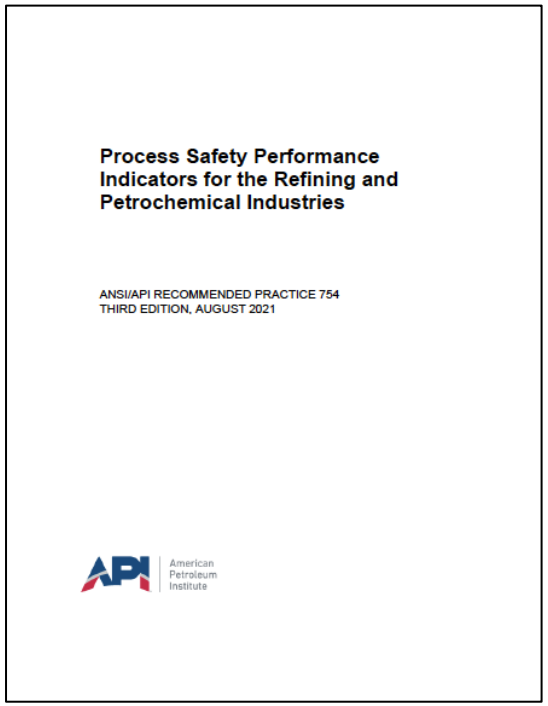


- We classified actual consequences, from trivial to catastrophic

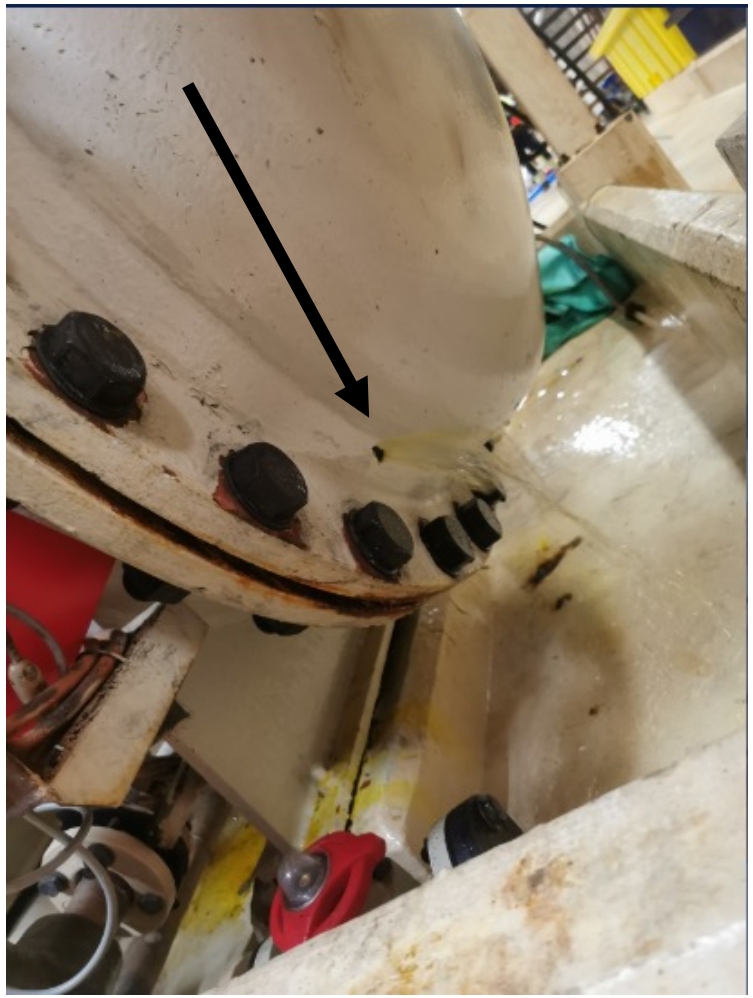


We classified causal factors according to API 754

1. Change management (MoC)
2. Communication
3. Design/construction
4. Equipment reliability (
5. Fixed equipment inspection
6. Human performance
7. Knowledge, skills and experience
8. Operating limits
9. Procedures (Operating/Maintenance/Contractor)
10. Risk assessment or incident investigation
11. Safe work practices or procedures
12. Work monitoring
13. Other

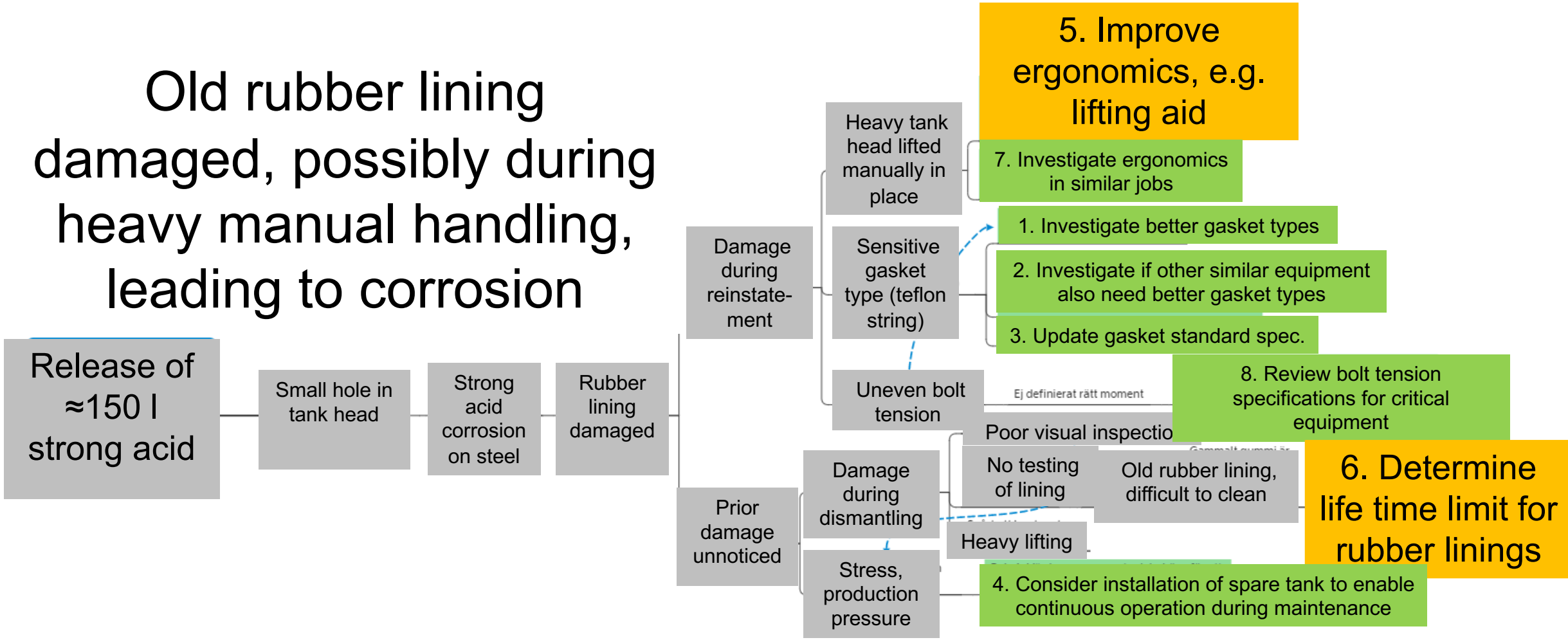


Example 1: Release of ≈150 litre strong acid



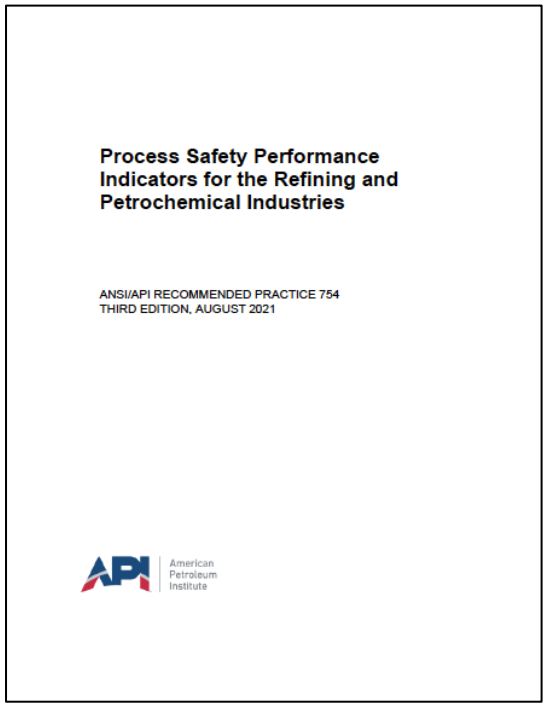
Cause analysis (from the incident database)

Old rubber lining damaged, possibly during heavy manual handling, leading to corrosion

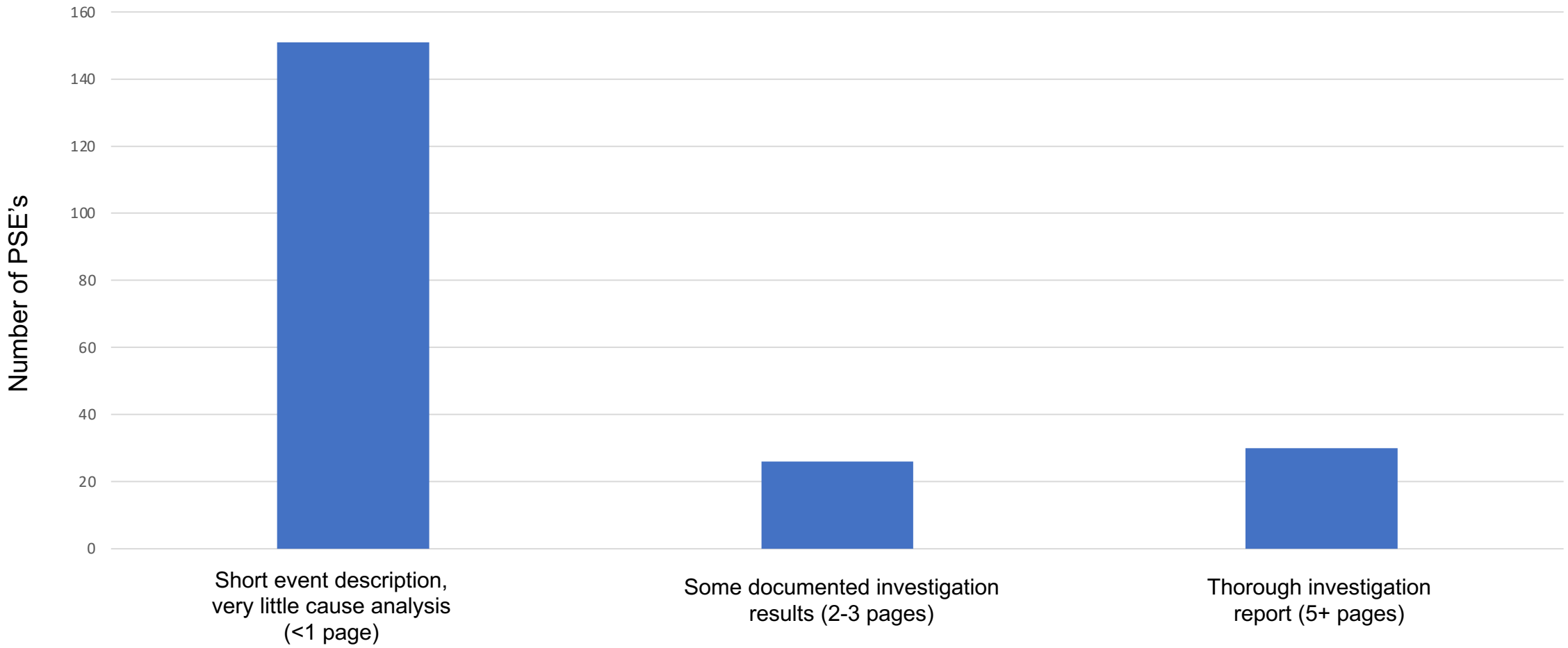


Causal factors for this example

1. Change management (MoC)
2. Communication
3. **Design/construction (fabrication or installation less than adequate)**
4. **Equipment reliability (preventive maintenance/testing frequency less than adequate)**
5. Fixed equipment inspection
6. **Human performance (ergonomics less than adequate)**
7. Knowledge, skills and experience
8. Operating limits
9. Procedures (Operating/Maintenance/Contractor)
10. Risk assessment or incident investigation
11. Safe work practices or procedures
12. Work monitoring
13. Other

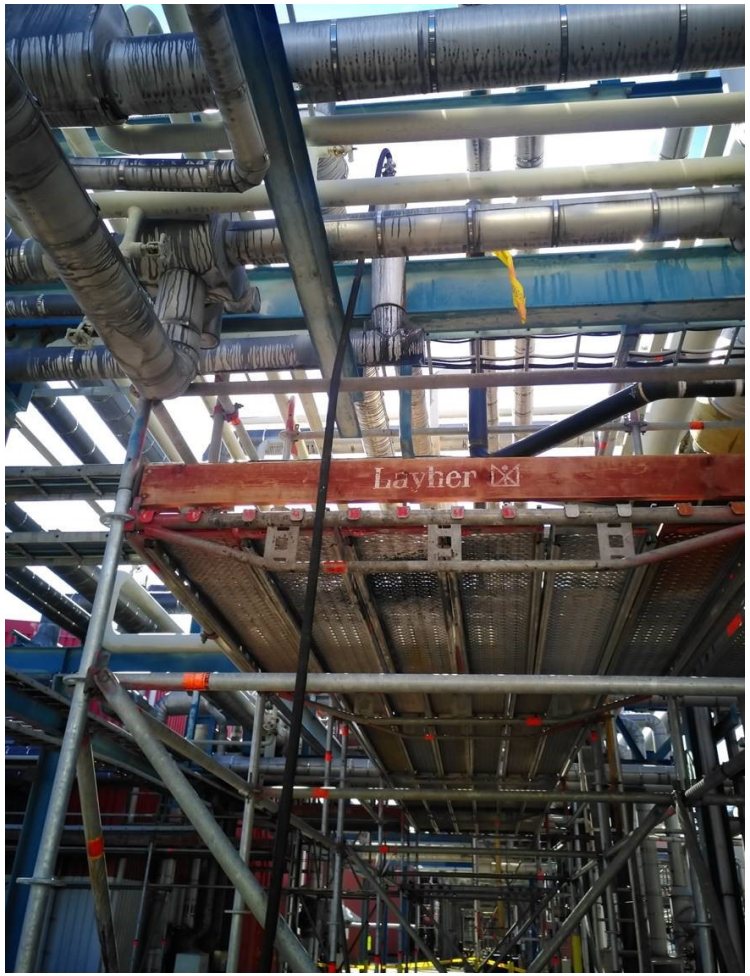


Generally, the information in the database was limited



Example 2: Release of 275-500 kg 20% caustic

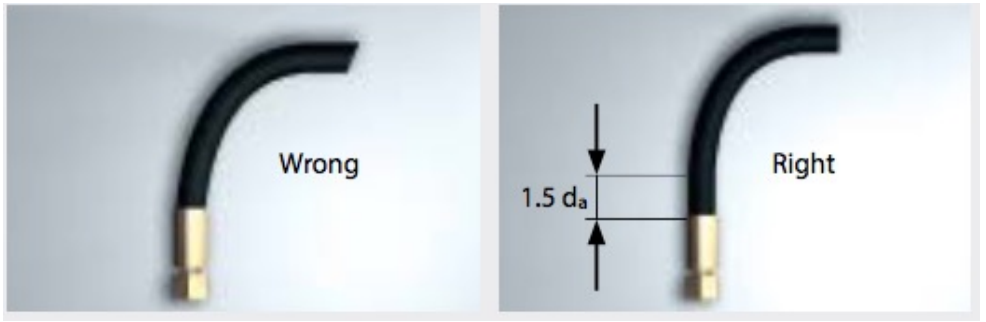
- Hose was left connected after flushing a caustic line with water
- Hose was badly bent
- No check valve
- A closed valve in the caustic line upstream was passing

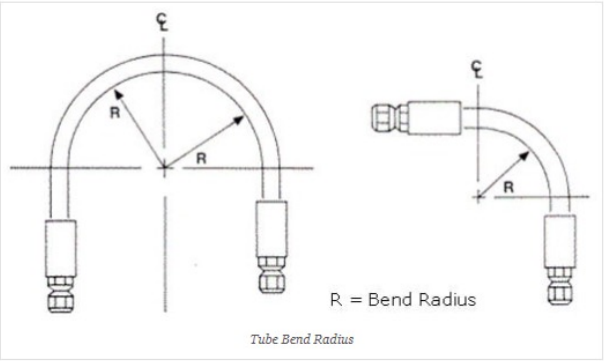


Causal factors and lessons learned

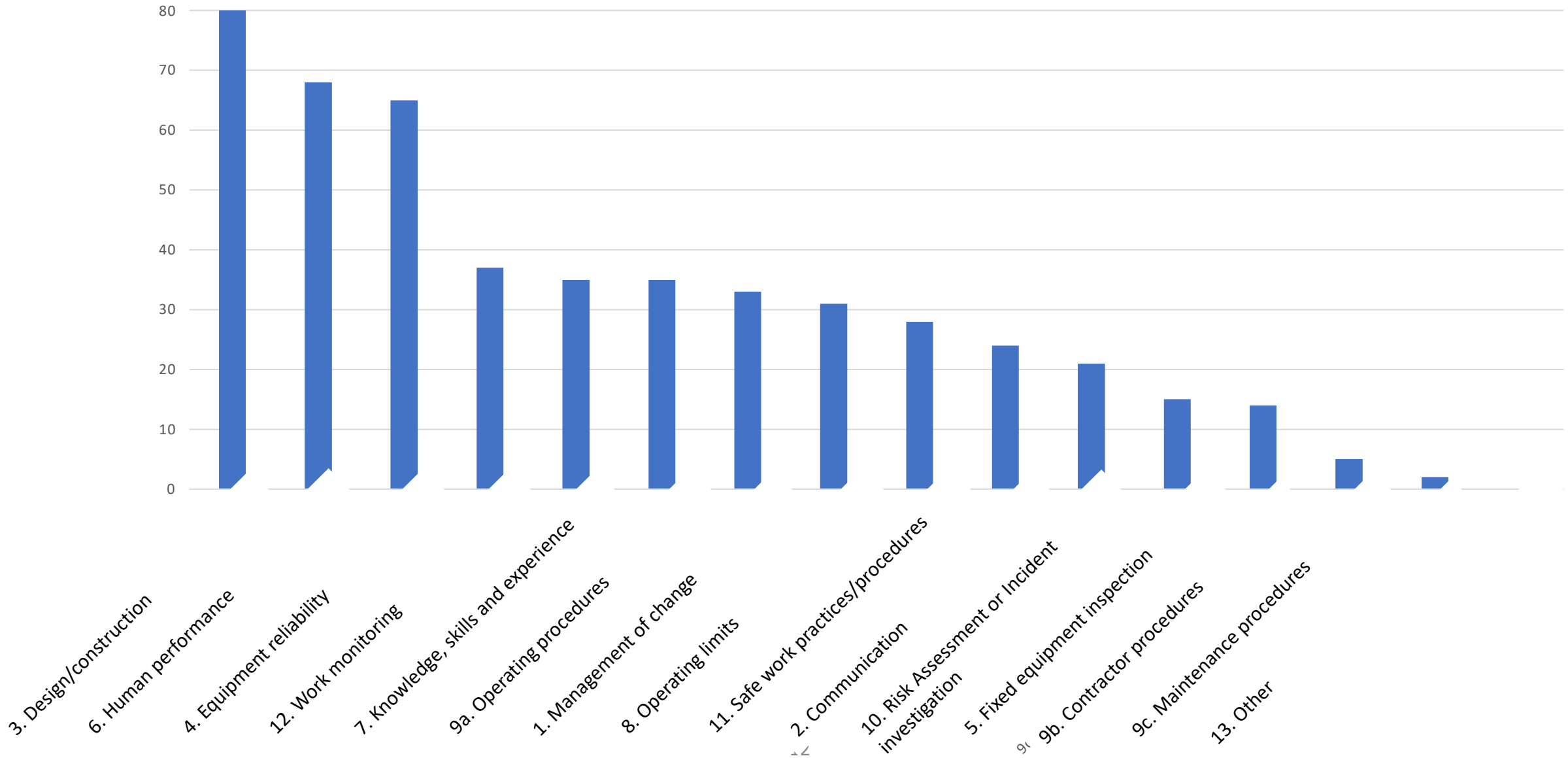
1. Change management (MoC)
2. Communication
3. **Design/construction**
4. Equipment reliability
5. Fixed equipment inspection
6. **Human performance**
7. Knowledge, skills and experience
8. Operating limits
9. **Procedures (Operating**/Maintenance/Contractor)
10. Risk assessment or incident investigation
11. Safe work practices or procedures
12. Work monitoring
13. Other

- Check valve must be used
- Hoses must be used correctly



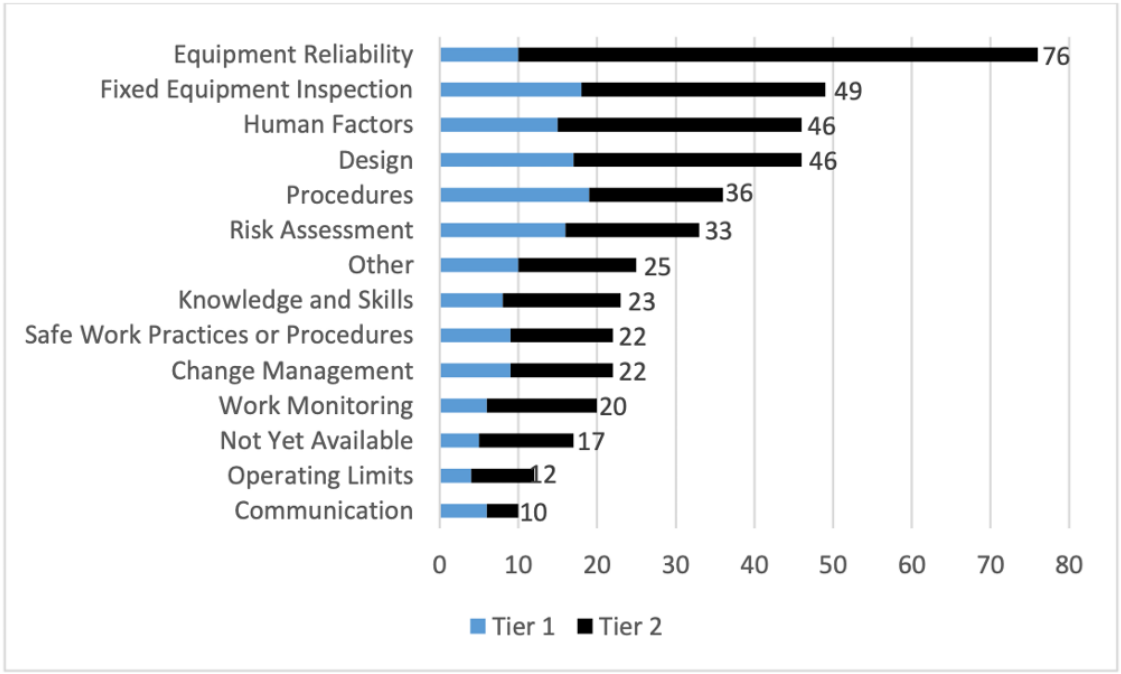


Number of times each causal factor was selected



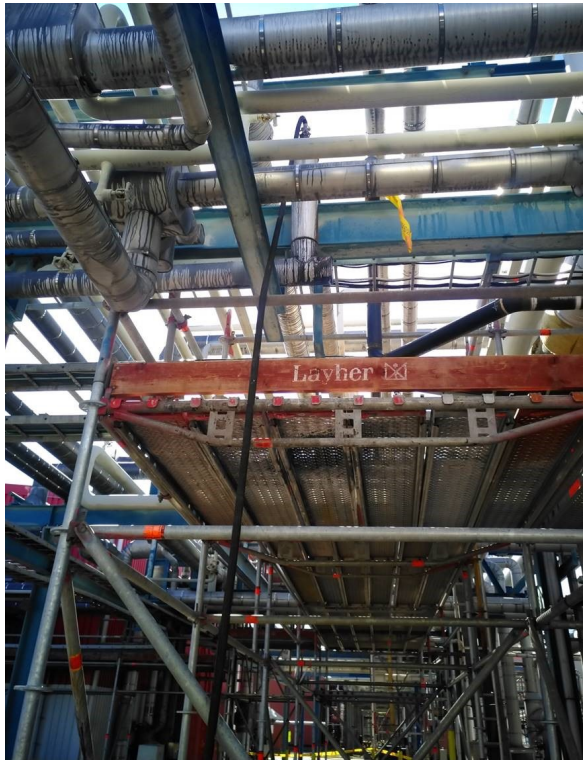
Comparing with Concawe's rapport

Figure 14 Number of Tier 1 and Tier 2 Process Safety Events (Manufacturing and Marketing) reported in 2021 by causal factor (note that more than one causal factor may be assigned to an event)



Conclusions about common causal factors

Inadequate design/engineering leads to cumbersome procedures and invites human error

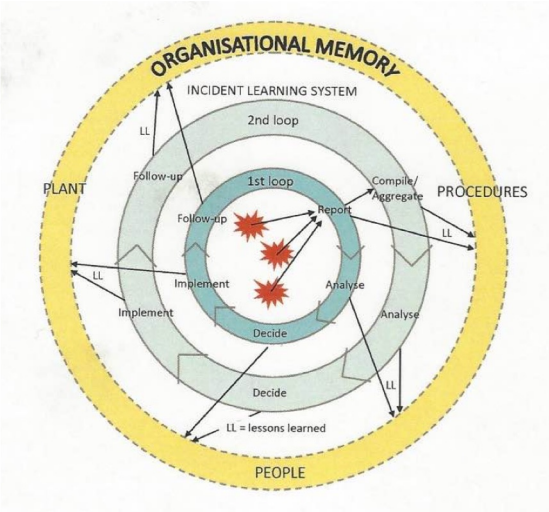


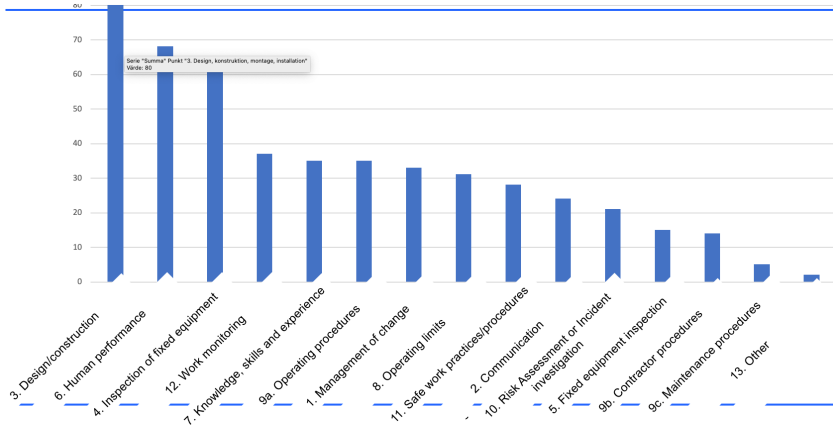
Inadequate maintenance (incl inspection) in aging plants leads to increased risk of both small and large leaks

Conclusions about learning from (small) incidents

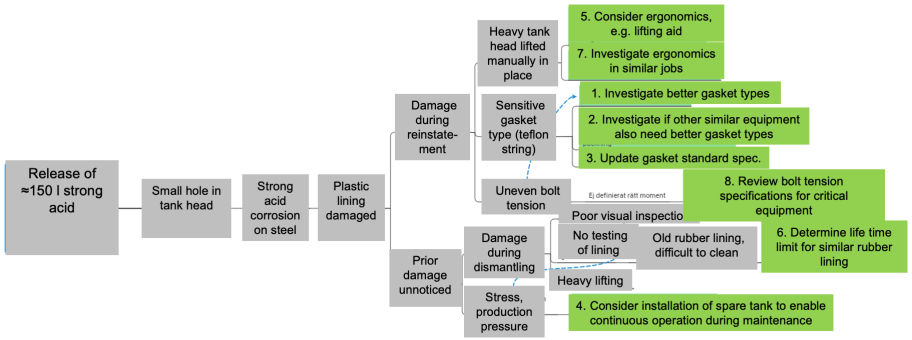
More efforts are needed to monitor and improve the quality of investigations and the outcome of recommendations, e.g.

- More involvement of process safety specialists in investigations (1st loop)
- Regular ”2nd loop reviews”, jointly by Safety and Production
- Management support and active involvement





Comments? Questions?



Conclusions

- Learning from small incidents ought to be improved
  - More involvement of process safety specialists in investigations (1st loop)
  - Regular reviews of PSE information in incident database (2nd loop)
    - Jointly by process safety specialists and production engineers/managers
  - Follow up actual outcome of recommendations!
- The use of PSE statistics can be problematic
  - Advanced classification models are difficult to apply consistently
  - Support and interpretation by process safety specialists is necessary

Thank you!

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