

2 Ways to improve Process Safety

- Audits and Incident Investigations an integrated approach

GLOBAL PARTNER
for a
SAFE WORLD



Pieter de Kort

General Manager Process Safety

DEKRA - Netherlands & Flanders

Chemical Process Engineer by training

1988 – 2004



2004 – 2007



CRODA

2007 – 2017



2017 -



Why Improve Process Safety?

Because it is

- needed – current performance is not good
- demanded – legal or social obligations
- wished – intrinsic motivation

How to Improve Process Safety?



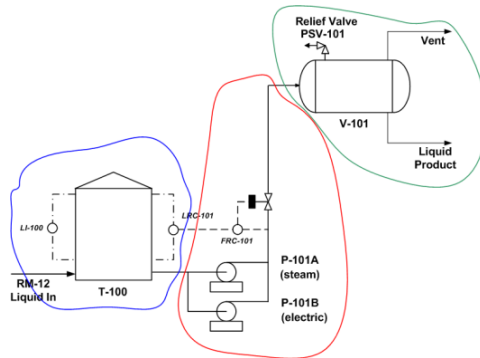
孔夫子 Confucius, Chinese Philosopher
551 – 479 BCE

By three methods we may learn wisdom:

1. Reflection, which is noblest
2. Imitation, which is easiest
3. Experience, which is the bitterest

Within Process Safety we apply all three ways

Reflection
HAZOP, JSA ...



Imitation
Standards, Norms



Experience
Incident Investigation



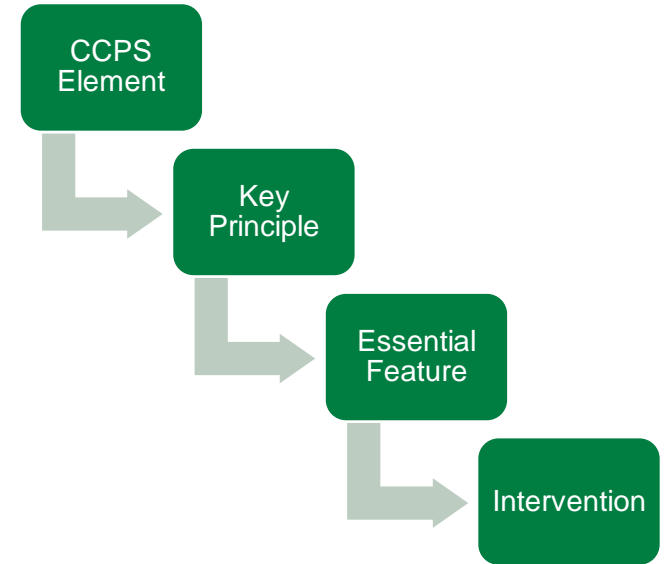
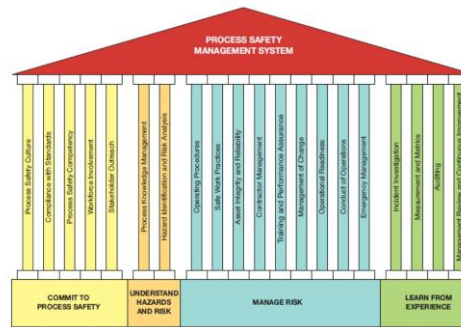
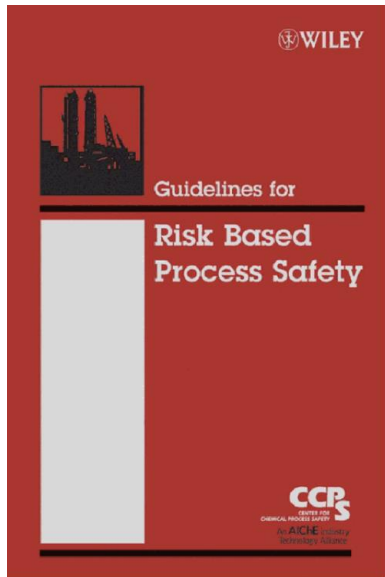
COMAH Control of Major Accident Hazards

Buncefield: Why did it happen?

The underlying causes of the explosion and fire at the Buncefield oil storage depot, Hemel Hempstead, Hertfordshire on 11 December 2005

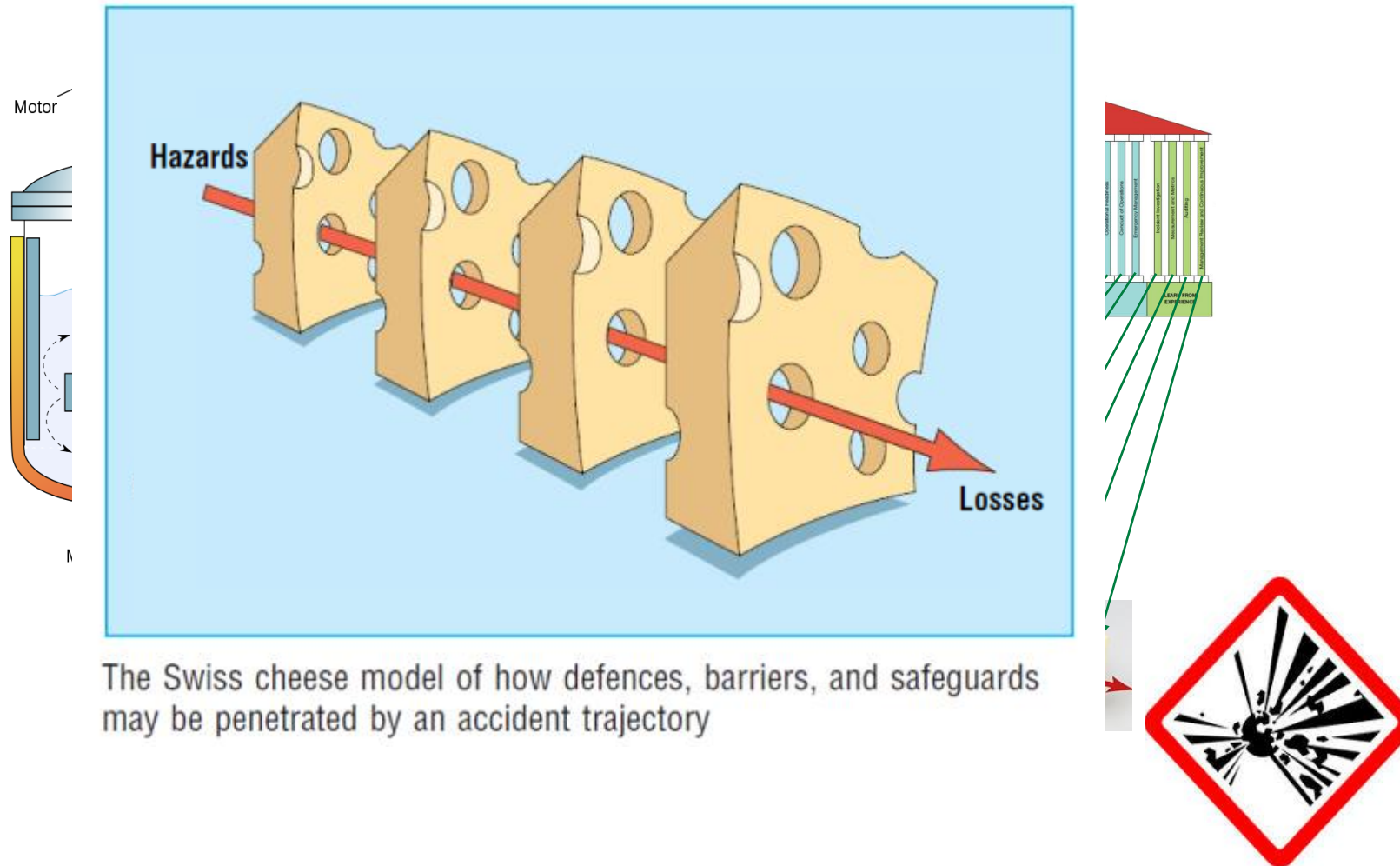


CCPS Risk Based Process Safety



Protection layers

- Risk Based Promotion of Safety & CREASON

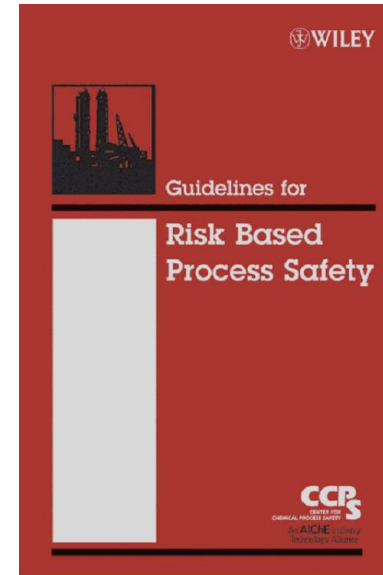


2 - Audits & Assessments

- Standards



- Guidance



#2 – DEKRA 's Organisational Process Safety assessment



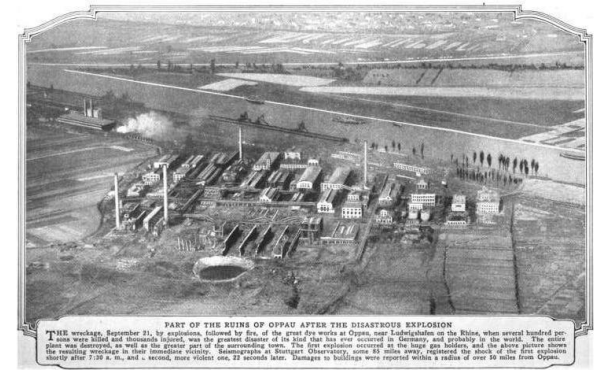
#3 – Learning from incidents



Do we really learn from past incidents?

E.g. Ammonium nitrate disasters

- Oppau, 21 Sep 1921, 561 fatalities, 2000 injured
- Toulouse, 21 Sep 2001, 29 fatalities, 2500 injured
- West Texas, 17 Apr 2013, 15 fatalities, 200 injured
- Tianjin, 12 Aug 2015, 114 fatalities, thousands injured
- Beirut 2020, 215 fatalities, 7,500+ injured, Property damage, 15+ billion USD



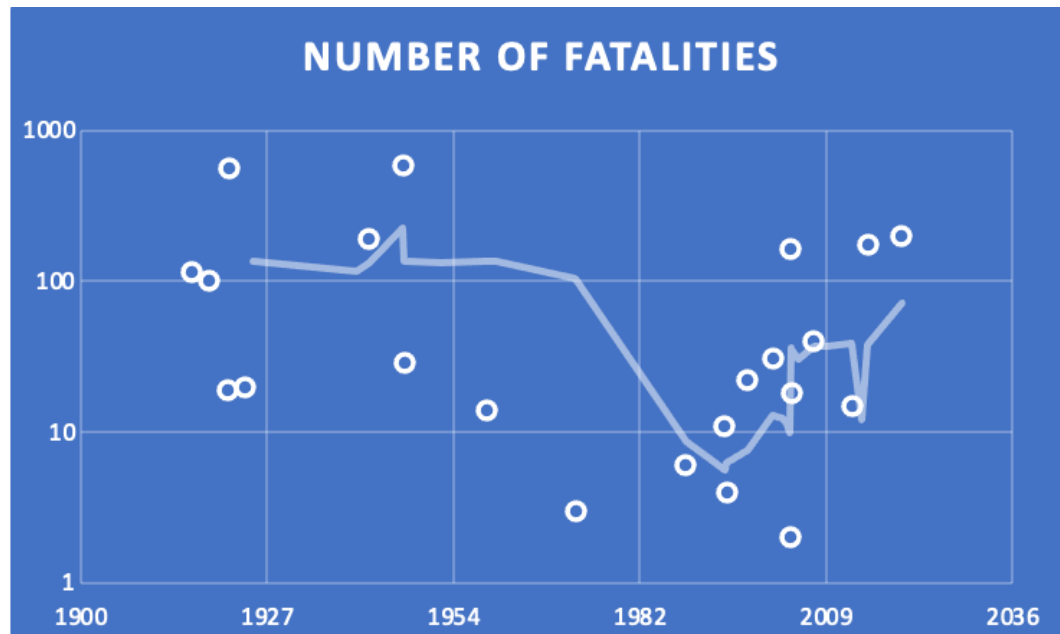
Unfortunately there are many more Ammonium Nitrate incidents

In total 2315 fatalities in 104 years

31 incidents

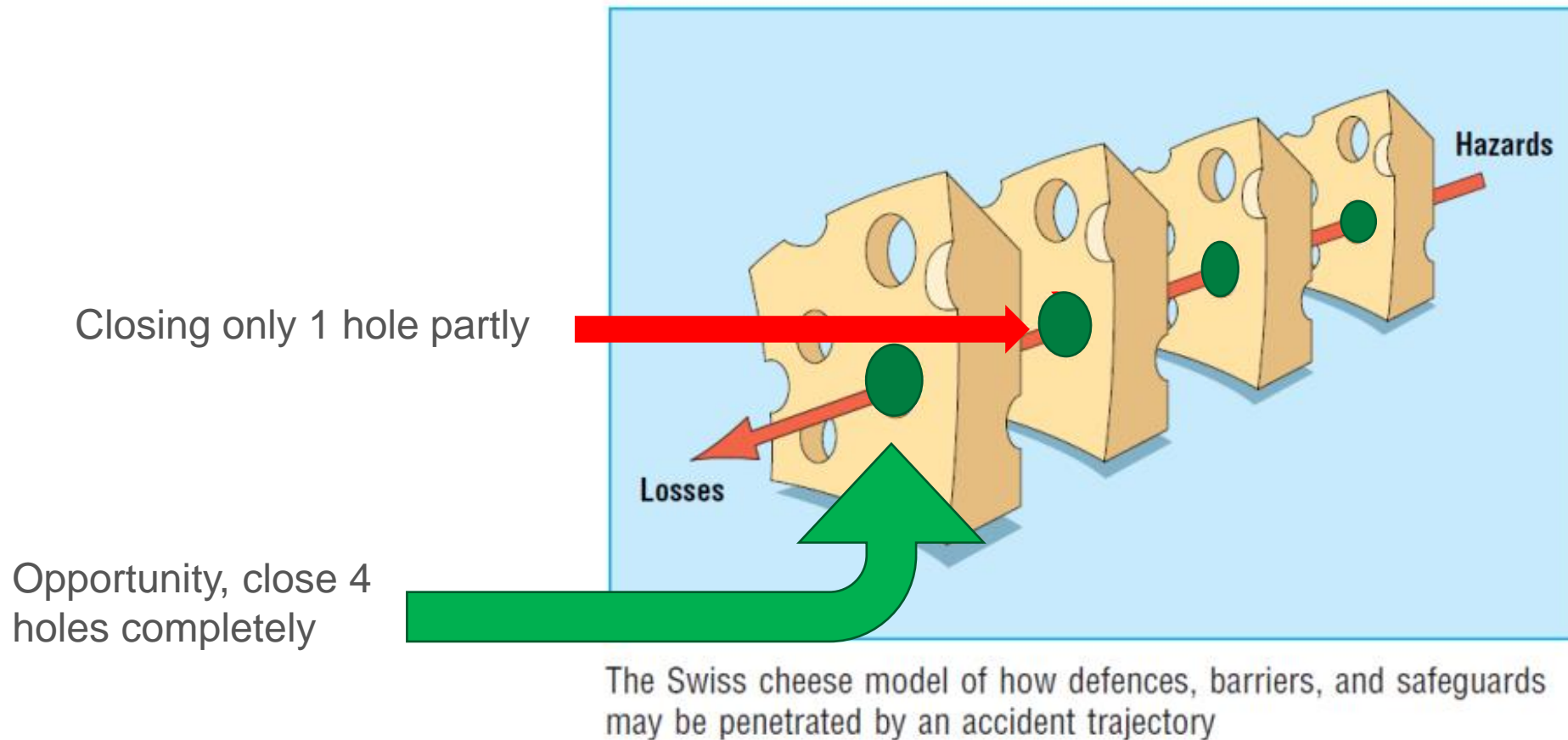
1 per 3 years

Average 74 fatalities per incident



Country	Place	Date	Fatalities
Spain	Estaca de Bares	6/29/1905	0
United Kingdom	Faversham, Kent	4/2/1916	115
United States	Morgan, New Jersey (now Sayreville)	10/4/1918	100
Germany	Kriewald	7/26/1921	19
Germany	Oppau	9/21/1921	561
United States	Nixon, New Jersey (now Edison Township)	3/1/1924	20
United States	Muscle Shoals, Alabama	4/4/1925	0
Belgium	Tessenderlo	4/29/1942	189
United States	Texas City	4/16/1947	581
France	Brest	7/28/1947	29
–	Red Sea	1/23/1953	0
United States	Roseburg, Oregon	8/7/1959	14
United States	Traskwood, Arkansas	12/17/1960	0
Australia	Taroom, Queensland	8/30/1972	3
United States	Kansas City, Missouri	11/29/1988	6
Papua New Guinea	Pargera Gold Mine	8/2/1994	11
United States	Port Neal, Iowa	12/13/1994	4
China	Xingping, Shaanxi	1/6/1998	22
France	Toulouse	9/21/2001	31
Spain	Cartagena, Murcia	1/1/2003	0
France	Saint-Romain-en-Jarez	10/2/2003	0
North Korea	Ryongchŏn	4/22/2004	162
Romania	Mihăilești, Buzău	5/24/2004	18
Spain	Barracas	3/9/2004	2
Mexico	Monclova, Coahuila	9/10/2007	40
United States	Bryan, Texas	7/30/2009	0
United States	West, Texas	4/17/2013	15
Australia	Wyandra, Queensland	9/6/2014	0
China	Port of Tianjin	8/12/2015	173
Lebanon	Beirut	4/8/2020	218

Current Incident Investigation practice is often:

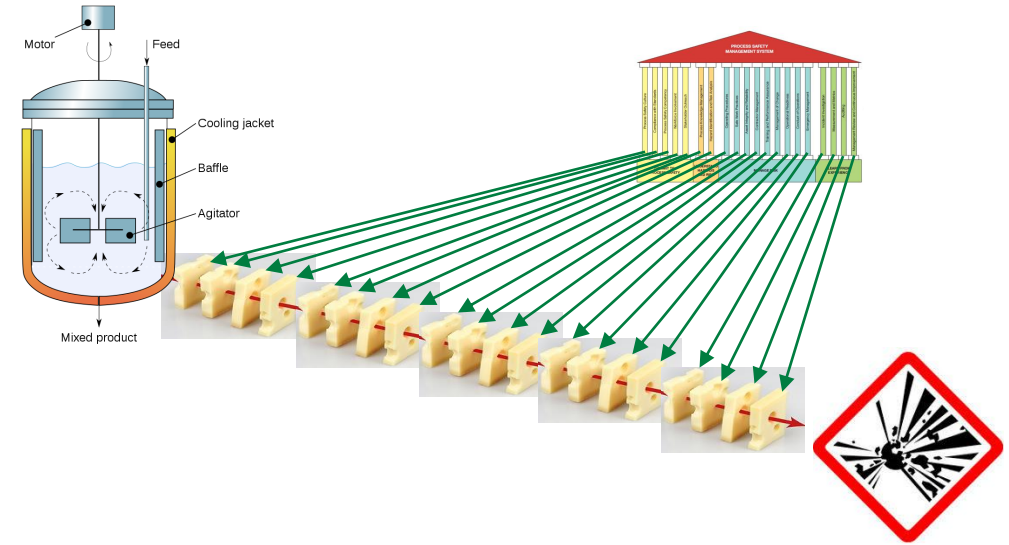


What to do?

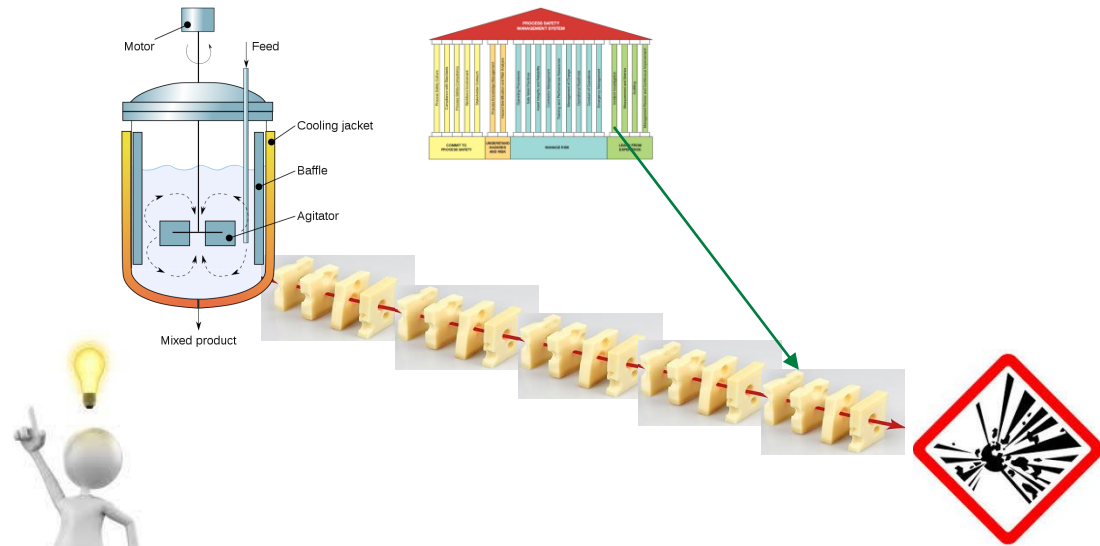
- Find all the holes
- Close completely

DEKRA's approach:

- “Guide word” assisted investigation plan

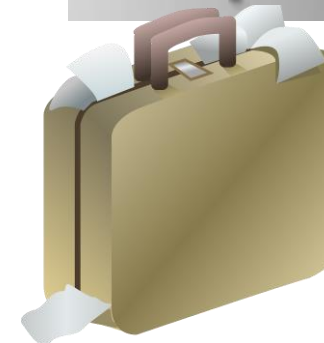


Example; Element Incident Investigation



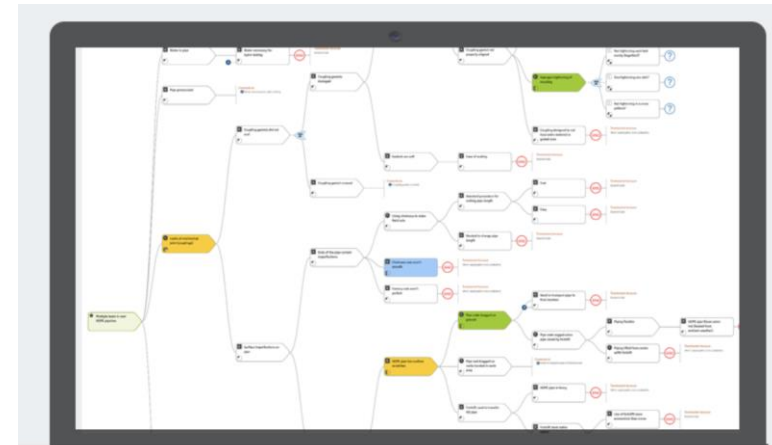
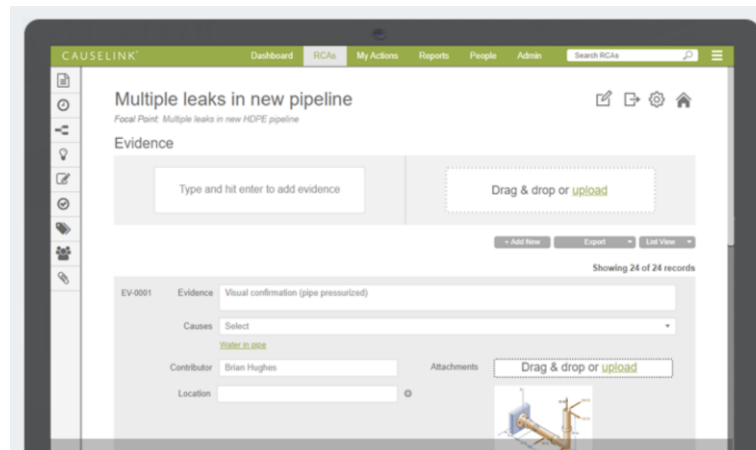
Investigation Questions:

1. Is there an incident investigation process? ✓
2. Did the incident or similar happen before? ✓
3. Was an investigation done before? ✗
4. What were the findings? ✗
5. Were the findings resolved? ✗

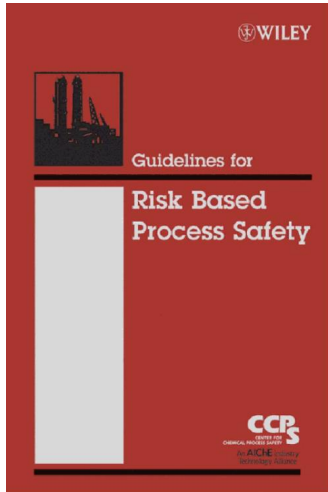


Process the evidence

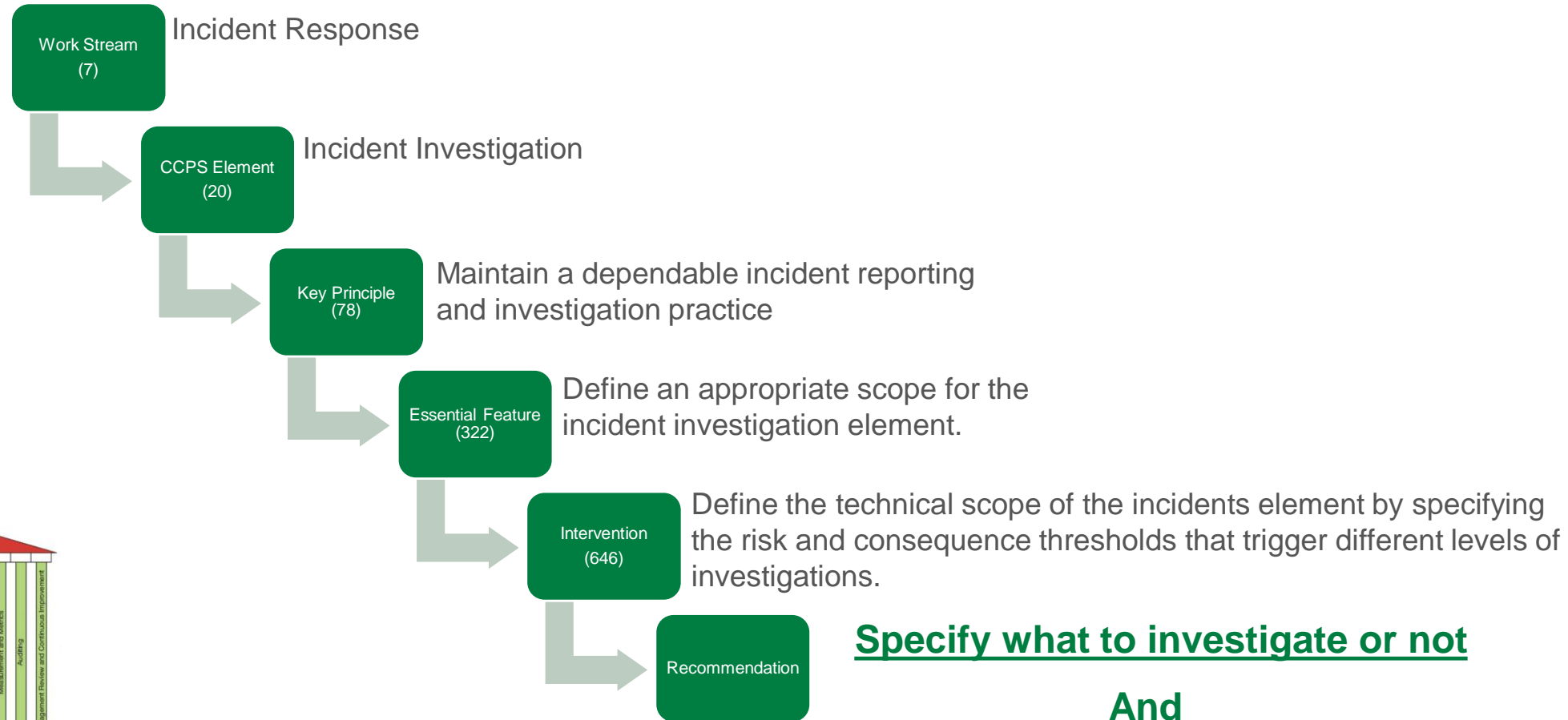
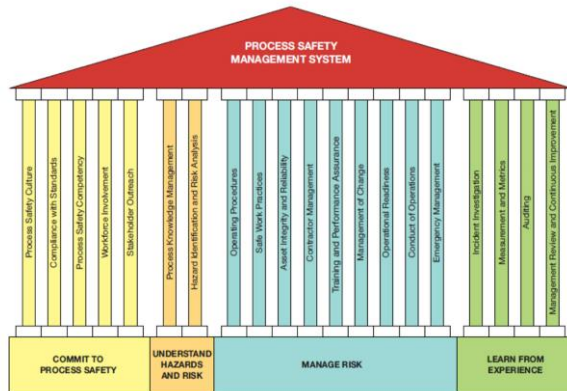
- Time line
- RCA
- Using state of the art software tool
 - Causelink[®] by Sologic



Define recommendations using the OPS database



931 pages



Specify what to investigate or not

And

Do this at corporate level!

Questions or Remarks?

Thank you and Stay Safe



DEKRA Process Safety
Meander 1051
6825 MJ Arnhem
The Netherlands
Tel: +31 88 968 38 47
process-safety.nl@dekra.com
www.dekra.nl