

Process Safety: Keeping the Peace in a post war Age

*Tools and Techniques to keep Process Incidents at bay in a stable, low
frequency scenario*

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Outline

In the High Hazard Process Industry, we have entered a stable, low Process Incident frequency phase – effectively, a post war state. Can the impact of Peacekeeping intervention following real war ceasefires, provide any lessons to help us maintain the current status quo in Process Risk Management.

Abstract

The war on Process Incidents has been raging for 200 years. As processing facilities evolved, the hazards they contained mutated, becoming bigger, more toxic and more energetic. As the hazards advanced, we improved designs, developed more robust barriers and reshaped culture. By first decade of the 21st century, the hazards appeared to have been subdued – as far as reasonably practicably.

So, if, finally the war has been won, how can we now best keep the peace?

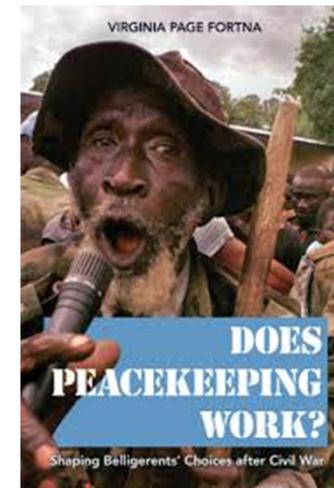
This paper briefly describes the history of the long war against Process Incidents, examine whether any of the Peacekeeping Scenarios set out in Page Fortna's book 'Does Peacekeeping Work?':

- Observation
- Inter-positional
- Multidimensional
- Peace enforcement

could be applied to the ongoing constraining of Process Incidents

Introduction

- Does Peacekeeping save lives?
- Undoubtedly
- Page Fortuna analysed 94 cases post civil war ceasefire for her book 'Does Peacekeeping Work?'
 - 36 of peacekeeping or enforcement
 - 58 without
- She found that peace keeping reduces the risk of another war by 55-60%



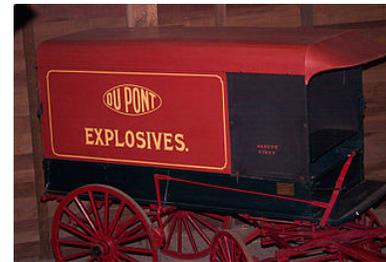
Introduction



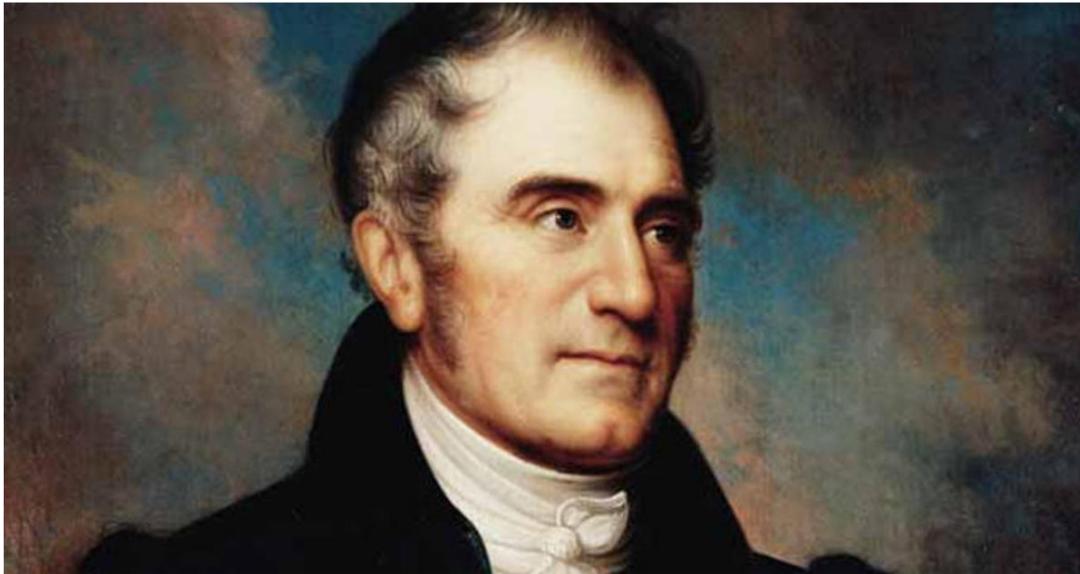
- Process Safety Incidents have led to 1000s of deaths:
 - Bhopal
 - Piper Alpha
 - Texas City
 - Deepwater Horizon
- Some metrics suggest that the war on High Hazard Process Incidents has been won
- If so, are there post conflict peacekeeping lessons which we can apply to Process Safety

The Start of the War

- The war on Process Risks started over 200 years ago
- An 1818 explosion killing 34 people occurred at Du Pont's Gunpowder mill in Delaware
- The accident was investigated, conclusions drawn and new safety measures put in place



The Start of the War



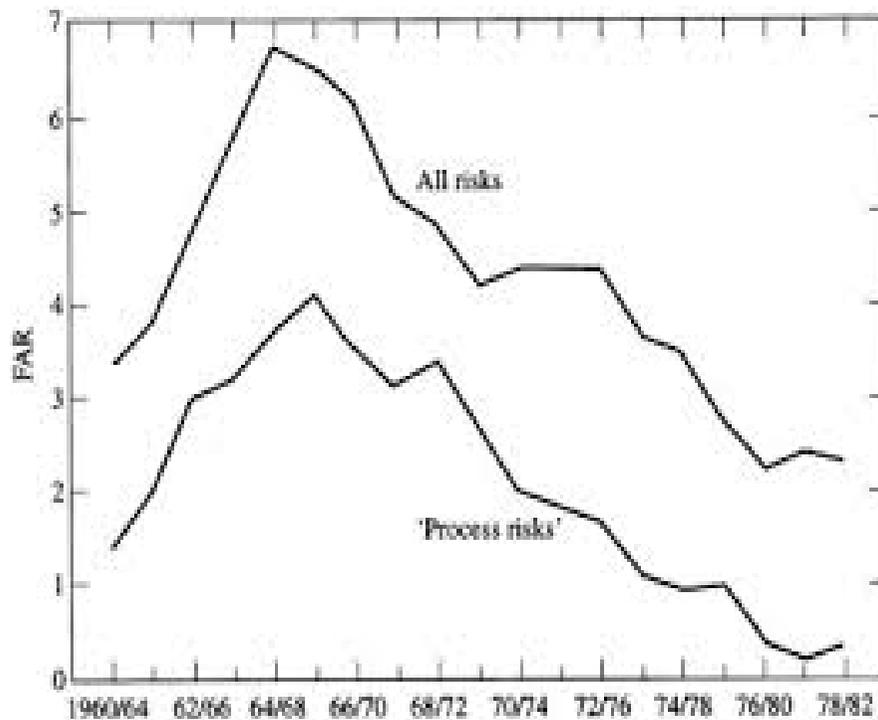
- These Measures were successful
- In 1820 a similar explosion occurred with no resulting fatalities
- The struggle against Process Risks had begun.

How Was the War Won?

- Chemical Plants built in the UK in the 1950s and 60s were:
 - Larger
 - Had bigger hazardous inventories
 - Operated at greater extremes
- The result was an increase in serious accidents.
- ICI's fatal accident frequency among workers doubled in the 8 years from 1960



How Was the War Won?

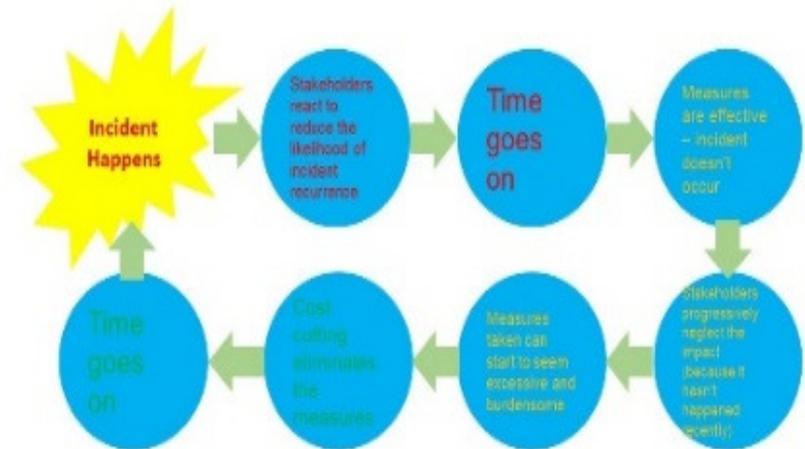


ICI Fatal Accident Rate from Process Risks 1960-82.

- Something had to be done.
- HAZOP was preferred to Inherently Safer Design as it was easier (cheaper?)
- And it worked, saving around 50 future lives

How Was the War Won?

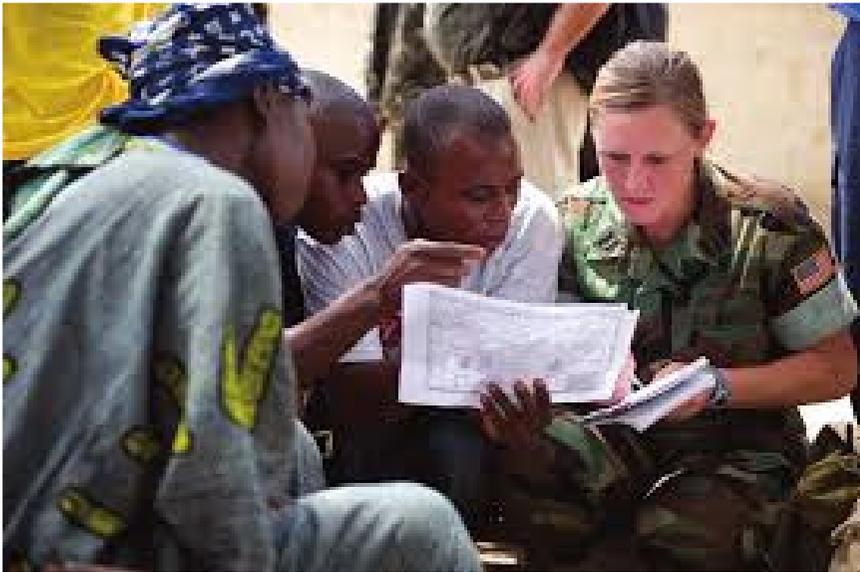
- Later SIL, LOPA and ALARP improved the situation further
- Process Hazards were increasingly corralled and contained
- The war against Process Risks has been won
- We are being lulled into a false sense of security



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The Process Risk Cycle

The Case for Peacekeeping Success and it's Mapping to Process Risk Intervention



- UN Peacekeeping helps countries navigate the difficult path from conflict to peace
- Founded in 1948 (along with the UN)
- In 2018 ~105k UN peacekeepers
- Currently (Jan 19) active in 15 locations worldwide

Peacekeeping Success and Mapping

- Sufficient similarities between belligerents and Process hazards?
- So overlap in several areas.
- Enough to merit further investigation.



Peacekeeping Success and Mapping



- Page Fortna describes 4 types of peacekeeping:
 - Observation
 - Inter-positional
 - Multidimensional
 - Peace enforcement
- I've added a 5th:
 - Transition Assistance

Observation

- Small contingents of military or civilian observers tasked with monitoring cease-fires etc
- Observation encourages compliance by increasing trust between parties
- RasGas Operator Care Program encouraged front line decisions to stop production if they sense 'things are not right'



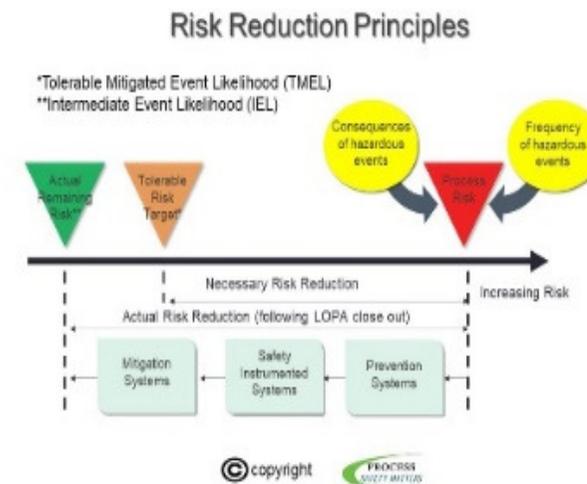
Observation



- In 2016, Eley had an HSE inspection of their explosives plant
- The outcome included subjecting their process to a HAZOP
- They enrolled on my IChemE HAZOP course
- By 2018 the HAZOP was completed and the HSE assuaged. It became part of their operating culture.

Interpositional

- Keeping 2 opposing military forces apart:
 - Insertion of impartial force
 - Establishing an appropriate buffer zone
 - Continuous monitoring
- Analogous with Safeguards between hazard and consequence



Multidimensional

~~Plan A~~

~~Plan B~~

Plan C

- A multifaceted peace keeping approach is often the most effective
- Similarly, in Process Safety, to much emphasis on a single element (e.g. HAZOP) can lead to vulnerabilities

Peace Enforcement

- Use of military assets to uphold peace against belligerents will
- A large and heavily armed force is required
- A Process Risk Mapping example is BP's Actions following Deepwater Horizon Disaster
- Targeted and Robust measures were required to save the company



Peace Enforcement

bp



Measures implemented by BP following Deepwater Horizon

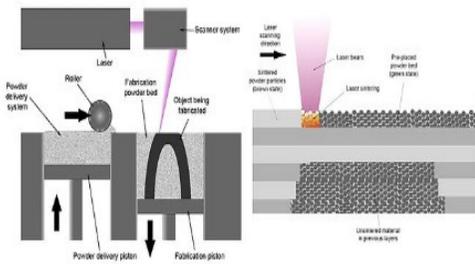
- Competence and Capability Development
- Auditing their Safety Performance
- Implementing Bly Report

Transition Assistance

- Operation to support transition to peaceful conditions and acceptable political structure after:
 - Civil Conflict
 - Struggle for independence / autonomy
- The nature of the risks in HHPIs is never constant:
 - Technology develops
 - New sectors are created



Transition Assistance

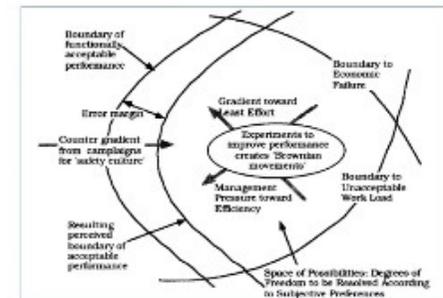


- New sector example: Direct Metal Laser Sintering
- Hazards include:
 - Metal Powder Dispersion
 - Exposure to Argon
 - Electrostatic discharges
 - Laser radiation

Transition Assistance

- In the presence of strong cultural and psychological forces, human behaviour migrates towards the boundary of acceptable performance
- For new or unknown hazards we must quickly understand and mitigate them before the boundary is breached

People and Organisations push the Boundaries – Rasmussen 1997



Parallels between UN Peacekeeping and HHPI Successes....and Failures



- Successes:
 - Sierra Leone (1999 – 2005)
 - Liberia (2003-2018)
 - The High Hazard Process Industry (2000-present)
- Failures:
 - Srebrenica 1995
 - Somalia 1993
 - BP Gulf of Mexico Disaster 2010

Sierra Leone

- The UN PK force operated between 1999 and 2005
- It helped implement a peace agreement post civil war
- *'Blue helmets disarmed more than 75 000 ex-fighters, including hundreds of child soldiers. The UN destroyed more than 42,000 weapons and 1.2 million rounds of ammunition'*



UN Secretary General Ban Ki Moon, Officially Ending the Peacekeeping Mission to Sierra Leone in 2006

Liberia



Declaration of the Successful Completion of the UK Peacekeeping Mission to Liberia in 2018 Mission to Sierra Leone in 2006

- Africa's first independent country
- Endured 2 civil wars between 1989 and 2003:
 - >250k Liberians killed
 - 1/3 of population uprooted
 - 80% of Liberian women suffered sexual violence
- Following UNPK intervention (16k personnel, 200 fatalities) in 2003, Liberia has held 3 presidential elections

Srebrenica

- July 95, Bosnian Serb forces swept into Srebrenica killing 8000 Muslim men and boys
- The UN had previously declared the town one of the safe areas
- 600 Dutch infantry were supposed to be protecting thousands of civilians

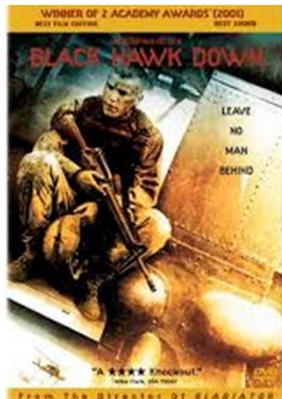


Srebrenica Dead

Somalia



Aid Distribution in Somalia



- First time UNPK used for humanitarian intervention
- PKs received hostile reception:
 - Several killed
 - Bodies paraded through streets
- Real Geo-political violence can generate significant media interest and sales:
 - 'Black Hawk Down' – Receipts \$171m
 - 'Deepwater Horizon' – Receipts \$139m

Learning from UN Interventions

- Transparency engendering experiential learning and improvement:
 - Following Srebrenica, a new mission category – peace enforcement – was agreed, developed and implemented from Kosovo onwards.
 - Dynamically determining the right size and character of the mission enabled the successful interventions to make an initial impact and then evolve over time with the local circumstances.
 - The commitment of the Peacekeeping stakeholders to maintain and sustain support over the long term.



Process Safety Related Peacekeeping Learning



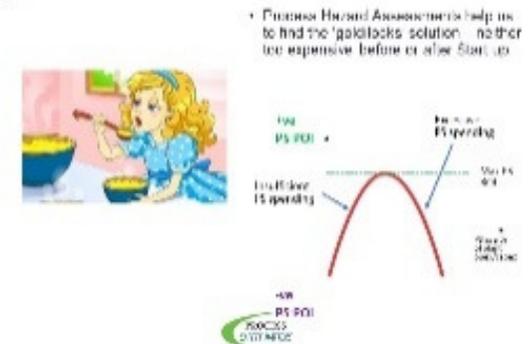
- PeaceKeepers can have a causal, effect on the stability of peace if:
 1. they reduce the likelihood of aggression by raising the costs of war or the benefits of peace for the peacekept;
 2. they disrupt spirals of fear and security dilemmas by reducing belligerents' uncertainty about each other's actions and intentions;
 3. they prevent accidents from occurring or control them so that they do not escalate to war; or
 4. they can deter or prevent one side from reneging on a political deal and excluding the other from power.'

Reduced Likelihood of Aggression

- Determining operator's optimal Process Safety Return on Investment
- Benefits:
 - Improved uptime
 - Personalising future live saved



A World Without Process Hazard Assessments



Optimising Process Safety ROI

Disrupting Spirals of Fear



- In post civil war Mozambique, surprise inspections identified unauthorised troops in police force
- In Process Safety we may do the opposite: inducing uncertainty and fear with acknowledged but surprise audits
- Justified by 'human nature' rather than lack of trust

Prevented Accidents can't Escalate

- The cooperation of Renamo leadership was bought in cash as patronage to keep minor incidents from developing
- PS analogy is zero tolerance of fugitive emissions to prevent escalation to major LOC
- This may involve some corporate discomfort



Preventing Agreement Reneging



Miran Site

- Genel Energy manage several oil/gas prospects in Kurdistan
- Don Lloyd was appointed HSE Director in 2013
- Following a visit to Miran site, he commissioned a EPF HAZID/HAZOP
- 81 Actions generated, 62 closed out before SU

Impactful Company Tenets

- While Hazards and Human Nature are impervious to Process Safety
- Other tenets (Organisational Culture, Structure, Design Philosophy) are not
- Their ease manipulation may be positively correlated with limited and engaged operator ownership



INEOS Example of limited engaged ownership



Jim Ratcliffe

- \$60bn turnover High Hazard Processing company, which operates around 100 sites.
- A monthly board meeting for each of 20 subsidiaries always starts with safety – both personal and process
- Founder and Majority shareholder Jim Ratcliffe is microscopically aware of safety performance and risk

Metaphor Learning and Intervention Tools

- Observation improves compliance
- Transparency and Communication increases trust uptake of learning from Incidents
- The more senior in the organisational hierarchy Peacekeeping behaviour is observed, the more impactful it is on Organisational Culture.
- Intervention is positively correlated with Operational Difficulty
- Inate Human and Organisational Behaviour require dynamic vigilance as situations evolve
- Emphasising the benefits of non incidents can be as, if not more, beneficial as impact of incidents
- A zero tolerance approach to loss can prevent escalation
- Appointing a referee who is trusted by and willing to listen to the conflict stakeholders