

Have the lessons on Permit-to-Work systems been learnt?

Process Safety Symposium, Istanbul

September 2018

Permit-to-Work (PTW) systems are essential tools within any Process Safety Management system

What is a PTW System?

- A formal procedure used to control the risks associated with potentially hazardous work within process plants
- Details the necessary precautions to be taken for known hazards and eliminates and/or controls the risk to employees and contractors undertaking work
- The permit is an agreement between the issuing authority and the party undertaking the work
- It is imperative that both parties understand the scope and location of the work

Guidance from Safety Regulator

- The UK safety regulator (Health and Safety Executive) provides guidance to the petroleum and chemical industries on the implementation and use of PTW systems AND isolation arrangements
- Within this document, the HSE sets out the crucial features required for a successful PTW system, and these are detailed as the following:
 - Display procedure
 - Permit interaction
 - Suspension and handover/hand-back
 - Authorisation and supervision
 - Training and induction
 - Monitoring and auditing

Differentiated types of permit are used to reflect the nature of the work activity and to avoid the use of a generic permit

Types of Permit	Explanation
Hot work	Control activities on-site that have the potential to produce ignition sources
Cold work	Control activities on-site that do not have the potential to produce ignition sources
Confined space entry	Ensure that the confined space is suitable to allow work to commence to avoid potentially dangerous work environments
Excavations	Ensure the employees are aware of any underground hazards and complete the necessary isolations
Working at height	Control activities on-site to prevent death and injury caused by a fall from height
Electrical work	Ensure that a procedure is in place to ensure all necessary electrical equipment is isolated prior to the commencement of work
Isolation	Ensure that a procedure is in place to ensure all necessary equipment is isolated prior to the commencement of work

Piper Alpha



Major Oil & Gas Corp.



DuPont



Where?

North sea oil platform situated north-east of Aberdeen

Petrochemical plant in the UK

Chemical plant in Buffalo, New York

What?

Leakage of flammable material and subsequent ignition leading to monumental fire, killing 167 workers

17 tonne hydrocarbon release

Welding work on a storage tank containing potentially hazardous chemical

Why?

- Absence of isolation procedure
- Lack of cross referencing
- Inadequate training of contractors
- Ineffective auditing system

- Absence of display procedure
- Inadequate isolation
- Lack of cross referencing
- Ineffective auditing system

- Inadequately completed permits
- Inadequate training of contractors
- Ineffective auditing system

Year?

1988

1998

2010

Major PTW related process accidents have common failings

Key feature	Piper Alpha	Major Oil & Gas Corp.	DuPont
Display procedure	X	X	
Isolation	X	X	
Permit interaction	X	X	
Suspension and handover/hand-back	X		
Authorisation and supervision			X
Training and induction	X		X
Monitoring and auditing	X	X	X

Conclusions

- Multiple PTW failures apparent in all three accidents
- Issues with monitoring and auditing present in all three accidents – these could have identified/prevented the accidents
- Monitoring and auditing of PTW systems is a critical “line of defence” activity to ensure effective PTW system design and operation



Question

“

Have the lessons on
Permit-to-Work systems
been learnt?

”



Answer

“

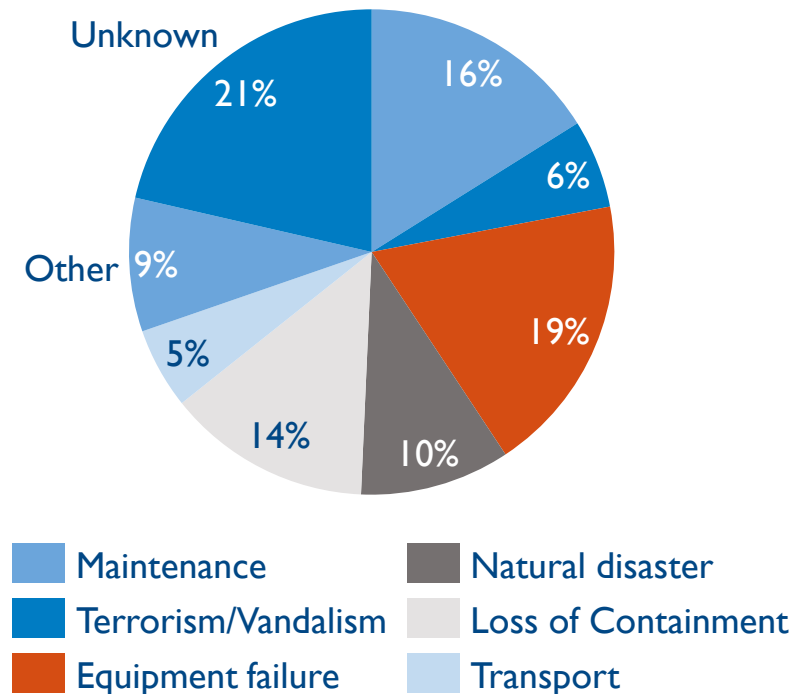
Perhaps not – we keep
having accidents where
the Permit-to-Work
system is implicated

”

But another conclusion might be that we really don't know....

We have identified that a high proportion of process incidents are due to maintenance issues, which **could** coincide with poor permit performance

Categorisation of incidents

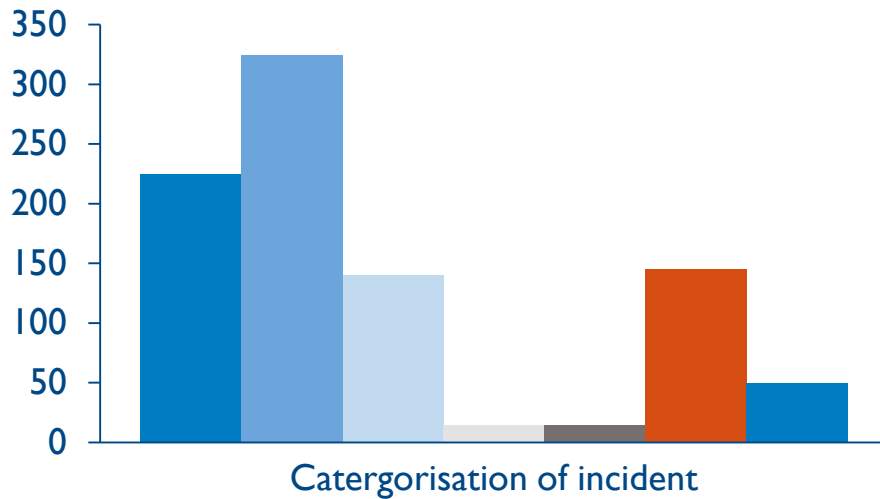


Database analysis

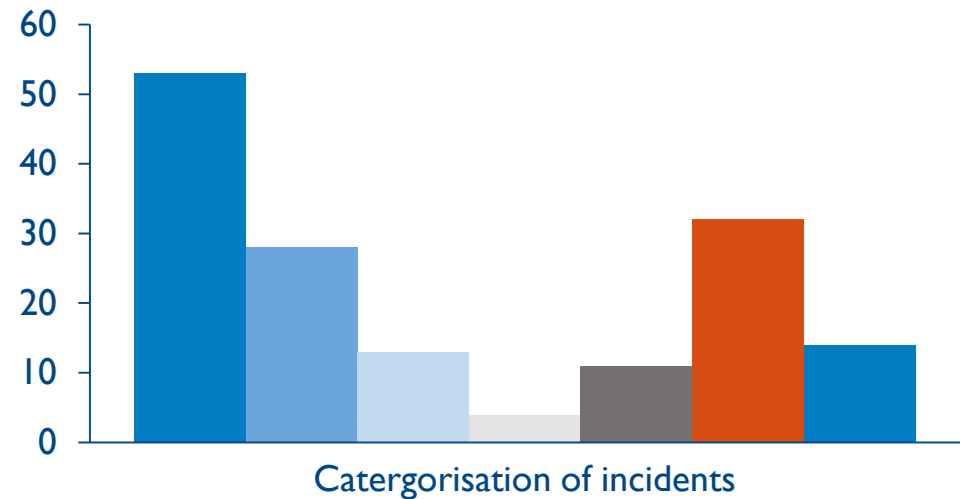
- Marsh UK (an insurance broker and risk management practice) produces biannual loss reports detailing accidents and incidents within the process industry
- 16% of all incidents were down to maintenance issues, which is comparable to the figure of 15% reported by the European Agency for Health and Safety
- Arguably, this 16% could be attributed to poor PTW system performance
- An important point to note is that 21% of incidents were attributed to “unknown” highlighting the poor quality of incident investigation and analysis

Maintenance contributes to over half of incidents resulting in at least one fatality

Number of fatalities

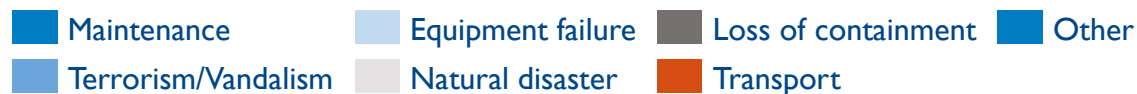


Percentage of incidents resulting in at least one fatality



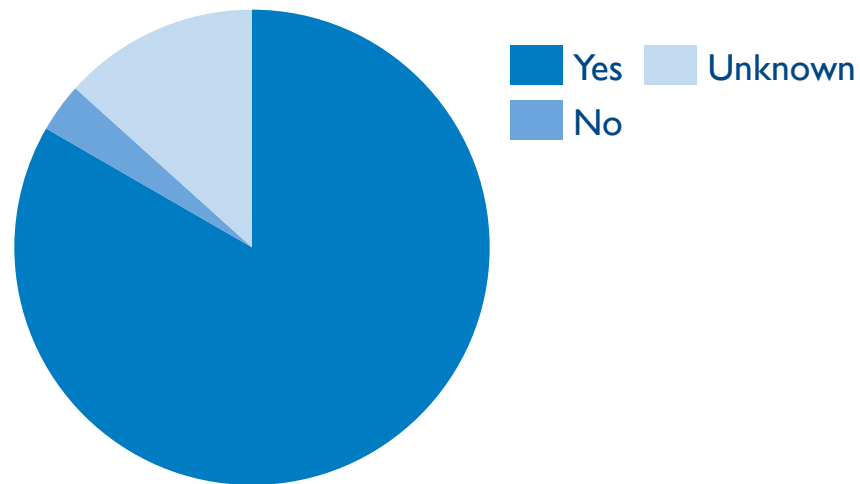
- Maintenance produces 25% of loss of life incidents
- Discarding terrorism/vandalism, maintenance would produce almost 40% of all fatalities

- Incidents during maintenance have by far the highest instance of at least one fatality
- Approximately half of all maintenance incidents result in at least one fatality



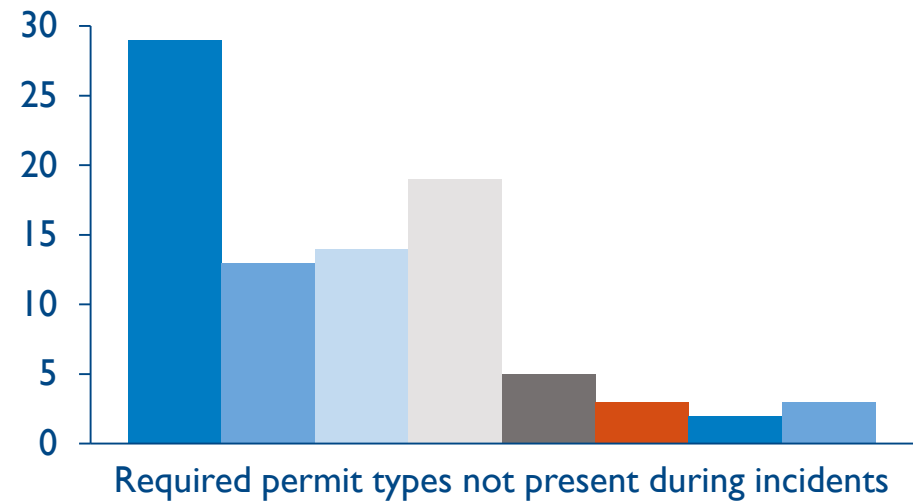
Our analysis shows that lessons about PTW systems from historical major accidents do not appear to have been learnt

Maintenance activities controlled by a permit



- Incidents that should have been controlled by an appropriate permit, resulted in a total of 197 fatalities in the period between 2006 and 2013

Required permit types not present during incidents



- Incidents occurring during maintenance show that the lessons learnt from previous incidents have not been fully understood and implemented



From a recent Process Safety Management audit of a major process industry facility – repeating a 2011 Process Safety Audit

Permit-to-Work and isolation of equipment arrangements remains weak

- List of Permit-to-Work authorised signatories was not up to date
- Need for clarification, including when a hot work permit is required, in the Permit to Work procedure and when gas monitoring is required
- The audit identified weaknesses in the electrical and mechanical isolation of equipment:
 - No cross reference between work permit and Isolation Tag
 - No checks by person undertaking actual work that isolation locks are in place
 - Mechanical isolation certificates are not updated to include modifications made during previous plant changes and are not located with the permit
- The audit identified a number of opportunities for improvements in the Permit-to-Work procedure and its implementation:
 - During the audit the permit users had not signed to confirm they had been briefed/understood the requirements
 - Poor handover arrangements

Other PTW issues we observe during Process Safety Management audits

Broader issues

- During audits we find permits “suspended” – often because they were issued without all the correct isolations/prevention measures and they get “suspended” during the audit to hide these issues
 - Sometimes the desire to get work done allows important systems (such as PTW systems) to be bypassed

- Paper, paper, paper – PTW systems seems to generate a lot of paper
 - For example, an Asian utility company produces a 40 page permit for work in a Power Station in confined spaces

- Outsourcing and contracting – with the steady increase in the amount of work and types of work being undertaken by contractors now at process sites, the need for robust PTW systems alongside effective contractor management is even more important

Ageing assets across the global process industry will require increasing volumes of maintenance, requiring effective PTW systems

Largest challenges

- Familiarity of employees with the permit systems and the resulting shortcuts that are frequently used when it is believed to be time saving and, therefore, beneficial
- It is often the case that experienced users of permit systems will unintentionally begin to undermine the integrity of the system
- Lack of third party permit sign-off when auditing permit systems, with permit issuer and acceptor often being the same person

Future concerns

- Ageing assets:
 - Within the oil and gas industry, many assets have exceeded their original lifetime
 - Half of the European major hazard losses of containment events, occurring from technical failures, are principally caused by the effects of ageing
 - Ageing installations will need continued maintenance operations to avoid constant containment losses, which will require effective PWT implementation
- Transfer to electronic systems:
 - Many companies have already, or are in the process of, switching to an electronic permit system
 - It is imperative that the experience gained from the old system is not lost, and current users should be involved in the transition

1 Permit-to-Work (PTW) systems are essential tools within any Process Safety Management system

2 Major PTW related process accidents have common failings

3 A high proportion of process incidents are due to maintenance issues, which could coincide with poor permit performance

4 Maintenance contributes to over half of incidents resulting in at least one fatality

5 Ageing assets across the global process industry will require increasing volumes of maintenance, requiring effective PTW systems

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