SAFETY BULLETIN 43/24

Work Control, Permit to Work and Task Risk Assessment

ASIA INDUSTRIAL GASES ASSOCIATION
No 2 Venture Drive, # 22-28 Vision Exchange, Singapore 608526
Tel: +65 67055642 Fax: +65 68633307

Internet: http://www.asiaiga.org LinkedIn profile: https://www.linkedin.com/company/asiaigaorg

PSM Element # 17, Work Control, Permit to Work and Task Risk Assessment

Introduction

The execution of maintenance and other non-routine hazardous work activities, if not appropriately managed, pose serious process safety risk that can claim lives, cause injury and damage facilities.

Work Control is the management of maintenance and other hazardous activities, to ensure tasks are caried out safely. Work control procedures typically include Hazard Identification and Risk Assessment, Permit to Work and associated processes.

Permits to work are special authorization documentation that ensures adequate risk has been accessed for the process and a level of control has been put in place to reduce the severity, likelihood, and potential of an incident occurring. These could be regulatory requirements, company policies, or general best practices. These are part of a systematic approach to managing risk through task review and authorization.

A permit to work (PTW) system ensures the safety of employees during hazardous and non-standard operations. It involves assessing the risks, establishing a proper safety protocol based on the risks, and proper communication throughout the entire process. The PTW system is designed to mitigate environmental, health, and safety risks in certain operations.

The PTW system starts with identifying hazards & risks mitigation measures. It also includes identifying the work's scope and appointing the people who are authorized to handle hazardous tasks and the people in charge of keeping the processes as safe as possible.

The permit-to-work is part of the entire safe system of work. While it starts with hazards identification and risks mitigation, it also involves training employees, regular briefings, establishing protocols, and monitoring the PTW system to ensure that it is doing its' job of keeping the workers safe. Upon completion of work, the permit form needs to be handed over back to the permit issuer to sign off and retain a record of the form. This is used as part of a control of work system.

Why is a PTW System Necessary?

When working in an industrial setting, there are risks that one cannot avoid. A PTW system is a necessary component of any business' control of work system and is designed to handle and mitigate the risks that employees face during maintenance and non-routine activities. These risks can be from sparks from welding practices, working in confined spaces, working at height, energized process sections or circuits, and more. In these settings, there is no way to eliminate these hazards, but there are ways to control them and keep employees safe.

Who needs a Permit to Work?

The PTW system is most commonly used in industries that deal with hazardous processes, such as construction and manufacturing. These industries handle significant risks and they put employees in situations where they can potentially get hurt.

This is why PTW systems involve a lot of documentation, assessment, training, and resource requirement. The PTW system involves letting employees know what, where, when, how, and why the work needs to be done. This is a formal system designed to give employees clear tasks and ways to handle the tasks in the safest possible manner.

So, if an organization deals with certain hazards and associated risks in its operations, it will benefit greatly from a permit-to-work system. This is a key part of the organization's work control strategy, hazard identification, risk assessment and management.

Types of Permit to Work?

PTW systems differ depending on the nature and complexity of the organization, but some of the common types of permits include, but not limited to following:

- Hot work
- Cold work (e.g., chemical cleanups, scaffolding, heavy lifting etc.)
- Confined space
- Excavation work
- Electrical work
- Working at heights
- Lock out tag out (LOTO)

When Things Go Wrong - Piper Alpha Disaster

Late in the evening of 06 July 1988, a series of explosions ripped through the Piper Alpha platform in the North Sea. Engulfed in fire, over the next few hours most of the oil rig topside modules collapsed into the sea. 167 men died and many more were injured and traumatized.

Failure of the Permit-to-Work (PTW) system was at the heart of the accident.

During the day shift work recertification of pressure safety valves (PSV) had commenced. This required the PSV to be demounted and blind flanges fixed securely to the open piping. The related condensate injection pump had to be isolated to stop it being activated. While Pump A was isolated and its PSV removed, condensate injection continued using parallel Pump B. The PSV was lifted by a crane and taken to the workshop for recertification. General overhaul of Pump A was also due to be carried out but that work had not yet started.

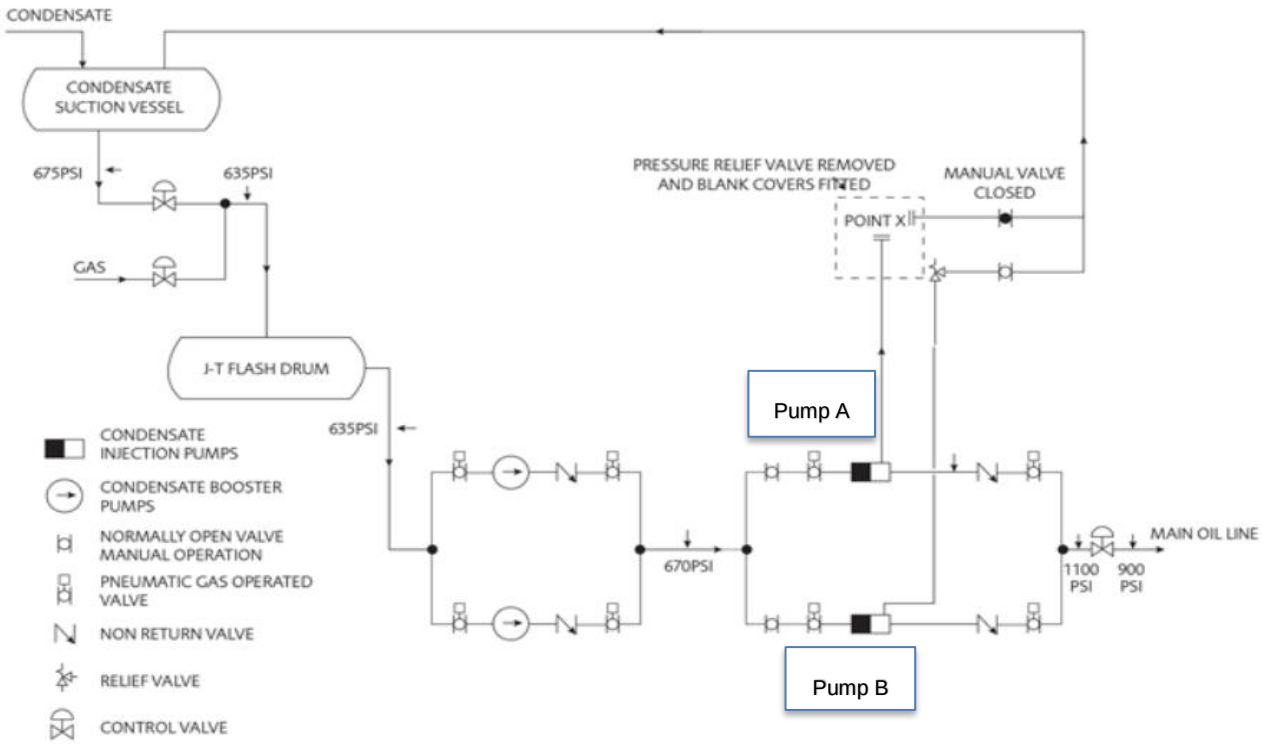
All this was controlled by two separate PTWs. When the PSV had been recertified, the fitter set about reassembling the valve to the piping and pump but no lifting equipment was available to hoist the PSV into position, as had been planned. In consequence, the fitter suspended the permit until the next day, leaving the piping blinded.

The PTW was criticized for not showing a clear enough distinction between suspension and cancellation of the permit. The fitter is believed to have left the suspended PTW in the office without pointing that out to the operators, who were, in any case, involved in a shift changeover. Information about the status of Pump A failed to get through to the control room operators. They therefore thought the PSV had been replaced as planned and knew that the planned maintenance on Pump A had not yet started.

When Pump B failed some 3.5 hours later and couldn't be restarted, the operators therefore believed they could get vital production restarted by reversing the electrical isolation of Pump A and switching to it. Without further ado, and under pressure to produce, they set that course of action in motion.

Soon after pump A was restarted the blind flanges leaked hydrocarbon vapour which found an ignition source. This triggered a small explosion that ruptured pipes receiving crude oil from neighbouring rigs which

Piper Alpha then pumped to the shore. The fire escalated over the subsequent hour and enveloped the main gas pipelines. Despite being able to see the fire, the other connected rigs continued pumping fuel into the fire on Piper Alpha. Production pressure was such that they sought approval from an on-shore manager rather than using their own initiative to shut down. By this time it was already too late. The gas pipelines failed catastrophically in three massive explosions, destroying the rig.



PFD of Piper Alpha Condensate pumps and safety relief valves (Photo Source: The Chemical Engineer)

This incident emphasizes the importance of discipline in the use of PTW and the critical importance of effective communication at shift handovers.

Learnings from the Incidents

Accident data from the industry sources indicate the failure of PTW systems as a main contributor to major workplace accidents. These catastrophic events often damage facilities, causing a loss of time and materials within that correlating industry, and can sometimes cost workers' lives.

Following are some of the lapses in PTW system which could give rise to major hazards:

- Wrong type of work permit used.
- Wrong information about work required on the work permit.
- Failure to recognize the hazards where work is carried out (e.g., flammable substances).
- Introduction of ignition source in controlled flameproof area (e.g., welding, non spark-proof tools, non-intrinsically safe equipment used in intrinsically safe zones);
- Terms of work permit not adhered to (e.g., failure to isolate plant and/or drain lines of hazardous substances).
- Poor isolation of energy source
- Failure to hand-over plant in safe condition on completion of work/cancelling of work permit.
- Unauthorized staff performing work permit functions.
- Poor management of the work permit system,
- Insufficient monitoring of the work permit system, and
- Others

Conclusion

The main factors contributing towards the success of PTW systems can be classified as organization, communication, human factors, procedure, tools and equipment, and supervision and competency.

All of these factors are of importance but communication, human factors and procedures are the key to avoid any PTW related failure.

Communication is to ensure no misunderstanding and neglect of essential precautions between operations and maintenance when plant was handed over to maintenance workers. Information on the work to be done, the correct equipment and its readiness for handing over is to be transpired and agreed by both parties during the communications.

Every permit must have written procedure and work instruction no matter how simple or complicated the permit is. Common violations are by passing or not following the correct sequence of the work steps. Without procedure or not complying to it can be very costly.

Negative attitude, negligence, carelessness, physical fatigue and non-attentiveness are among the common human factors that can result in PTW failure.

Tools and equipment must be in sound conditions or else can have severe impact on the safe implementation of PTW. Gas detectors that are not calibrated, exposed cable of the electrical tools, defective high-pressure hoses, inappropriate personal protective equipment, wrong scaffold material specification and substandard fittings are examples that can cause serious accidents. The examples are not exhaustive. As a rule of thumb, all tools and equipment must be inspected and certified fit before they are used.

Supervision is always critical in PTW activities involving hot work, line breaking and vessel opening, confined space entry, overhead and mobile crane, hydro blasting, excavation, scaffolding, and energized electricity. Supervision can be continuous as in the case of confined space entry.

Competency means skilled, knowledgeable, and experienced personnel. Typical examples are the gas tester, welder, crane supervisor, electrical responsible person, radiography officer, safety officer and so on and so forth. Their competency must be checked and verified before any work execution is allowed.

Most importantly, organization plays a major role to ensure the successful implementation of PTW by showing strong management commitment and exercise firm enforcement.

References:

- AIGA 099, *Process Safety Management*, www.asiaiga.org
- AIGA 011, *Work Permit Systems*, www.asiaiga.org
- Incidents that Define Process Safety, Center for Chemical Process Safety, AIChE, Atherton J., Gil F.
- Hazards in chemical system maintenance- permits in Safety and Accident Prevention in Chemical Operations, Kletz T.A.
- UK Health & Safety Executive, Report on Isolation and permits to work - Safe maintenance.

Disclaimer

All technical publications of AIGA or under AIGA's name, including Codes of practice, Safety procedures and any other technical information contained in such publications were obtained from sources believed to be reliable and are based on technical information and experience currently available from of AIGA and others at the date of their issuance.

Where AIGA recommends reference to or use of its publications by its members, such reference to or sue of AIGA's publications by its members or third parties are purely voluntary and not binding.

Therefore, AIGA or its members make no guarantee of the results and assume no liability or responsibility in connection with the reference to or use of information or suggestions contained in AIGA's publications.

AIGA has no control whatsoever as regards, performance or non-performance, misinterpretation, proper or improper use of any information or suggestions contain in AIGA's publications by any person or entity (including AIGA members) and AIGA expressly disclaims any liability in connection thereto.

AIGA's publications are subject to periodic review and users are cautioned to obtain the latest edition.