

## PERMITS-TO-WORK IN THE PROCESS INDUSTRIES

John Gould

Environmental Resources Management, Suite 8.01, 8 Exchange Quay, Manchester M5 3EJ;  
John.gould@erm.com

The paper presents the collective results from a number of Safety Management System audits. The audit protocol is based on the Health and Safety Executive publication 'Successful health and safety management' and takes into account formal (written) and informal procedures as well as their implementation. Focused on permit-to-work systems, these have shown a number of common failings. The most common failure in implementing a permit-to-work system is the issue of too many permits. However, the audit protocol considers the whole risk control system. The failure to 'close' the management loop with an effective regular review process is the largest obstacle to an effective permit system.

### INTRODUCTION

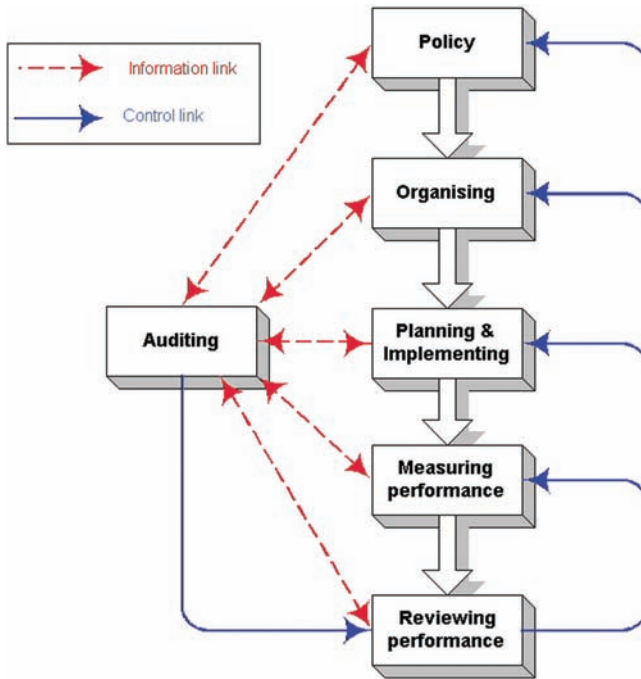
'Permits save lives – give them proper attention'. This is a startling statement made by the Health and Safety Executive (HSE) in its free leaflet IND(G) 98 (Rev 3) *PTW systems*. The leaflet goes on to state that two thirds of all accidents in the chemical industry are maintenance related, with the permit-to-work (PTW) failures being the largest single cause. Given these facts, it comes as no surprise that PTW systems are a key part in the provision of a safe working environment.

Over the past four years Environmental Resources Management (ERM) has been auditing PTW systems as part of its key risk control systems audits. Numerous systems have been evaluated from a wide range of industries, covering personal care products manufacturing to refinery operations. These evaluations have identified a number of common failings and with repeatedly the same recommendations being made. Interestingly, recently published guidance from the HSE (HSE 2005) has not addressed many of these failings. These failings and recommendations are summarised below.

### AUDIT PROTOCOL

The audit protocol used by ERM is based on the HSE guidance (HSE 1997) *Successful Health and Safety Management*. The protocol breaks the risk control system into the six key elements described in the guidance. This structure is illustrated in Figure 1. The organisational element is further subdivided into four activities that are necessary to promote a positive health and safety culture. These four activities are:

- methods of **control**;
- means of securing **co-operation** between individuals and groups;
- methods of **communication**;
- **competence** of individuals.



**Figure 1.** Key elements of successful health and safety management

Control, co-operation, communication and competence are collectively known as the four ‘Cs’ of safety culture. Information on these activities in one risk control system is often applicable to the organisation’s whole safety management system and safety culture.

This format is also used for the assessment checklist in HSE’s PTW guidance (HSE 2005). This format has been used in this paper to describe generic PTW failings and list commonly made recommendations.

**POLICY**

The policy commonly referred to as aims or purpose, sets down the basis of the risk control system. A PTW system is a formal and recorded process to control hazardous work. The PTW system is much more than the permit form(s). A PTW system that fails to document its purpose is vulnerable to misinterpretation. It is common for the PTW policy (purpose/aim) not to be documented. Well developed quality assurance systems often fail to address this failing, falling into the trap of describing the purpose of the document rather than the purpose of the PTW itself.

A PTW system without a documented purpose or aim can degenerate into an authorisation to work or worse a ‘*legal*’ document whose primary aim is to transfer responsibility to the lowest level possible, usually the permit receiver.

The policy needs additional detail in the form of objectives. These objectives provide a framework for developing the PTW system. They are also the basis for identifying key performance measures and targets. The HSE PTW guidance (HSE 2005) suggests ten objectives for PTW systems. These are suitable as the basis for developing site-specific objectives. Site management needs to consider what it expects from its PTW system when deciding objectives.

#### COMMON FINDING 1

Permit-to-work systems should have documented purpose and objectives.

### ORGANISING

The responsibilities and relationships of those personnel who have roles in the PTW system need to be defined in terms of their control, co-operation, communication and competence. The permit system will often involve personnel not directly employed by the organisation (contractors and visitors). Special attention needs to be made to organisational arrangements for these groups since they may not be familiar with the site or its hazards.

### ORGANISING – CONTROL

The PTW system needs clear lines of responsibility for the operation and ownership. Responsibility of the PTW system can rest with the safety or quality teams. However, operation or manufacturing groups are heavily involved with the PTW system and should have some control on its development. Ideally, ownership of the PTW system should rest with a named person who has sufficient time, resources and authority to actively pursue improvements.

#### COMMON FINDING 2

Responsibility for the permit-to-work system should be clearly allocated.

There are many roles within a PTW system. These include:

1. specifying work;
2. identifying the work area and equipment;
3. examining the work site;
4. identifying how the work may interact with the surroundings or nearby activities;
5. identifying the hazards;
6. identifying the preparation work to allow the job to start;

7. specifying the precautions;
8. specifying ongoing tests or checks to allow the work to continue safely;
9. communicating the information to the work team and equipment operators.

The level of authority for the various tasks needs to balance knowledge of the task and those personnel who have an overview of the whole area. Operators and leading hands may have greater equipment specific knowledge than the area or plant manager. However, junior grades can miss interactions with nearby activities. Junior grades occasionally lack authority. They can be put in a very difficult position, where permits are being sort by very strong willed individuals who can influence the permit issuer. The most common resolution is to set the level of authority based on the hazards associated with the work. Hot work and confined space entry often require a higher level of authority than other work.

The most common failing found by the audits is allocating the permit issuing role without allowing the time to issue permits. Permit issuers are regularly asked to issue ten to thirty permits in the space of one or two hours. At this rate, the issuer is given an impossible task and unable to spend sufficient time for each permit.

Often roles within a PTW system are allocated to personnel who have insufficient time to perform the duties expected of them.

### COMMON FINDING 3

Consideration must be given to an estimate of the time for each permit and the maximum number of permits that need to be issued.

### ORGANISING – CO-OPERATION

The nature of the PTW system means that it operates at the interface between various groups. Operations, engineering, contractors and managers all have roles in the PTW system. One surprising finding is the expectation of senior managers that groups will co-operate without their active encouragement and support. Consultation mechanisms beyond the legal requirements are not common. Those systems that do operate, are often ineffective and overlook simple questions such as *what do you think of the permit system*. They frequently miss out contractors who may have important contributions to make (e.g. contractors may have recently experienced several different types of permit systems as they move from site to site and this can provide a valuable insight).

Those responsible for the PTW system need to seek out comments from all groups involved in the PTW system. This can be achieved through focus groups but there is no substitute to going to the workplace and talking to the workforce.

### COMMON FINDING 4

Development and review of the permit-to-work systems must include consultation with all relevant groups especially contractors.

## **ORGANISING – COMMUNICATION**

One of the objectives of a PTW system is to aid communication between those in control of the area and those carrying out the work. Good communication will only occur if the conditions are suitable. The permit issuing points are often an afterthought in planning the layout of the site. Most permits are issued in an office. Although this is a good environment for issuing permits, if more than one group needs a permit, it is rare to find a place space for the other groups to wait without putting undue pressure on the issuer. An office with five to ten engineers all waiting impatiently is not a conducive to good permits.

A key part of the communication process is the identification of the equipment. This is closely related to plant labelling. There are many advantages to having all the equipment tagged, lines colour coded, and the direction of flow marked. Even with all this in place, it is easy for the incorrect line to be opened or the wrong pump removed. The workforce at one facility had tackled this problem by tying coloured ribbons to mark the equipment. This excellent idea that only needed to be made formal and the good practice promulgated over the whole facility.

The permit design plays an important part in communication. The permit is a record of the conversation between the issuer and receiver. Most permits use check lists as part of specifying the hazard and the controls. Simple planning, such as deciding if the site standard personal protective equipment should be included on the permit will avoid confusion.

If the permit is going to be an effective communication beyond the issuer and receiver, then it needs to be displayed. Keeping the permit in the pocket of the worker or retaining it within the permit issuing book does not aid communication. Permits should be displayed at the work location. A copy also needs to be displayed at the issuing point. The permits are best displayed on board that reflects the layout of the plant. This allows the permit issuers to be aware of others permits that may interact with the permit being issued.

Many modern plants have central control rooms. The operators in these control rooms need to be made aware of the work being undertaken in the plant they are operating. If the permit copy is not displayed in the control room then some other system of communication needs to be made.

## **ORGANISING – COMPETENCE**

Competence is the part of the PTW system that has been found to have the least deficiencies. Most organisations recognise the need to train their permit issuers and receivers. The training courses are normally very good, tested at the end and regularly updated. The weak area is the training of contractors who do not sign on permits and senior managers who may have to countersign permits for high hazard work.

## **COMMON FINDING 5**

All site personnel should be familiar with the PTW system. The depth of knowledge and training should be proportionate to their involvement.

## PLANNING AND IMPLEMENTATION

There is one recommendation that is almost universally applicable;

- reduce the number of permits issued.

Large numbers of permits dilutes the attention from the high-risk work where concentration on details is essential. Too often permits have been used to control access of personnel on the plant. Unnecessary permits devalue the whole system and can turn the whole PTW into a paper exercise. When considering the scope of a permit system, it is useful to ask what value the permit adds to the work.

The number of permits can be reduced by:

- controlling routine jobs with standard operating instructions and competency;
- controlling access (where no work occurs) through personnel reporting to the control room and if necessary a register;
- revalidating permits with work that continues without change for more than one day.

## COMMON FINDING 6

Reduce the number of permits issued by ensuring permits are only issued where necessary.

The second most common finding that has the potential to undermine the PTW system is transfer of authority. The workforce may view the permit as a legal document or a piece of paper that transfers authority from managers. This can lead to issuers over prescribing personal protective equipment to '*cover their backs*'. When this occurs, individual workers are left to pick the most appropriate personal protective equipment from the comprehensive list highlighted on the permit.

Every opportunity should be taken to emphasise the safety function of the permit. Permits should be valued for the information they provide to the individual and the control to the operational group.

## COMMON FINDING 7

Promote the permit system as adding value to completing the job safely.

## MEASURING PERFORMANCE

Industry invests significant resources in PTW systems. Given this, it is surprising on the lack of attention generally paid to measuring the performance of this safety critical and expensive activity. The common difficulty is often associated in identifying what to measure.

The incident reporting and investigation system must be able to identify where failures in the PTW system have been a contributory factor to the incident. This is not the case in most of the incident reporting and investigation system examined. This deficiency

breaks an important feedback loop that would identify where the PTW system is failing in its safety function.

HSE have been promoting leading indicators in their initiative on safety performance measures (HSE 2004). Identifying performance measures is closely related to setting objectives. Objectives should detail desired outcomes. The first objective for a PTW system suggested in the HSE guidance (HSE 2005) is:

- *clear identification of who may authorise particular jobs (and any limits to their authority) and who are responsible for specifying the necessary precautions.*

Measures can be identified by considering what success would look like. For the above objective, the following outcomes may be evident if it was successfully implemented:

1. a responsible person appointed to authorise permit issuers;
2. the authorised permit issuers informed in writing;
3. a system to inform permit users (list of permit issuers and the limit of their authority);
4. the permit users informed of the list;
5. no permits issued outside the authority of the individual (failure to meet objective).

Many of these successful implementations can be measured. Examples of measures are:

1. a relevant person is appointed;
2. an up to date list of permits issuers is produced;
3. each permit issuing point has a list of issuers posted;
4. the current list and their location is included in the induction training;
5. permits examined and found to be issued outside the authority.

This process can be repeated for each objective and many more measures may be identified. Not all the measures are suitable as performance measures. Some will be too trivial, others may be too difficult to measure. The whole process should arrive at a small number of performance measures that are relevant and have data that is easy to collect. From the examples above, displaying an up to date list of permit issuers would be a good performance measure. This could be measured every month.

Success criteria can be set against these measures. There are difficulties in setting the success level. For example, is it reasonable to expect the list always to be current? Personnel change and lists quickly become out of date. A better expectation is that the list would be correct for 80% of the time would allow slippage for one month per year.

#### COMMON FINDING 8

Use the objectives to derive appropriate performance measures for the permit-to-work system.

One measure from the example requires the completed permits to be examined. Completed permits are a valuable resource that is often ignored. Reviewing permits is an essential feature that is missing from many PTW systems. Some reviews should be by the line

managers conducted on live permits. Completed permits can be peer reviewed by other permit issuers. This has many benefits including:

- a learning exercise for the reviewer;
- the review can include an assessment of effectiveness;
- the issuer will know some of their permits will be scrutinised;
- provides an opportunity for informal peer pressure to produce good permits.

An excellent PTW monitoring checklist is provided in the HSE guidance (HSE 2005).

### COMMON FINDING 9

A sample of live and completed permits should be examined and assessed for quality and compliance.

### AUDITING

Too often managers view performance monitoring as audits. The definitions (HSE 1997[2]) of measuring performance and audits are:

- **audit** – the structured process of collecting independent information on how well the safety management system is performing;
- **measurement, monitoring, and checks** – the collection of information about implementation and effectiveness of plans and standards.

Collection of information by managers cannot be considered audits since they are not independent. Such information gathering cannot assess the adequacy of the PTW system. However, it is essential as a performance measure.

There are many audit protocols and it is beyond the scope of this paper to review them. However, many audits protocols concentrate on compliance and fail to make judgements on the adequacy of the system.

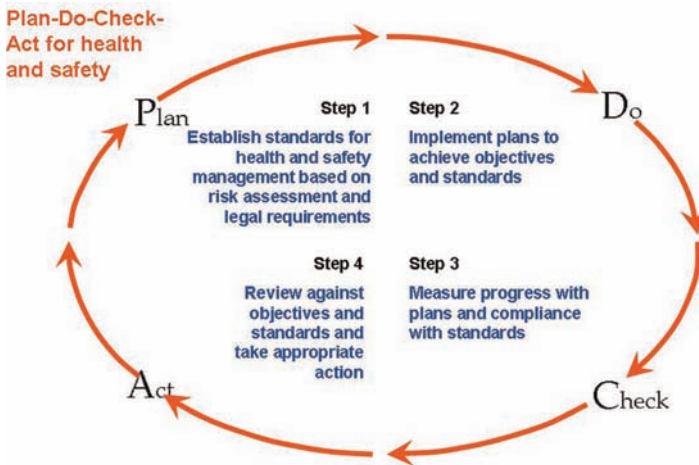
### REVIEWING

The review process is an essential element within many quality systems. The review process *closes the loop* in the plan-do-check-act cycle. This cycle is illustrated in **Figure 2**. Most reviews concentrate on compliance. This fails to fulfil health and safety policies that have a commitment for continual improvement. Sadly, reviews are often not scheduled, they consider limited information, and rarely produce plans for improving performance.

HSE's best selling publication *Successful Health and Safety Management* (HSE 1997[2]) provides little guidance on the review process. However, good guidance is given on the planning process, most of which is directly applicable to the review. Reviews should consider information from the following sources:

- monitoring performance;
- audits;





**Figure 2.** Plan-Do-Check-Act cycle

- consultation with stake holders;
- benchmarks and industry guidance.

The review should consider the following questions:

- is the system working as intended (compliance);
- are we measuring the right things?
- are the measures adversely affecting the performance?
- have informal practices been introduced (and why);
- is the system adequate:
- is the system proportional to the risks;
- can we do better?

The answers to these questions should lead to a plan for the following year including setting objectives and where appropriate targets.

#### COMMON FINDING 10

The whole permit-to-work system should be reviewed for effectiveness and compliance. These reviews should lead to annual improvement plans.

#### CONCLUSION

The PTW system is a key safety system. Many of these systems have significant weaknesses and scope for improvements. The most common failing is the issue of too many

permits. This leads to a devaluing of the PTW system and a loss of control on high hazard work.

The common failure that prevents continued improvement lies within the review process. Many PTW systems are not reviewed, and where they are, it only identifies changes that affect the written arrangements.

Reviews should be scheduled regularly (yearly) to assess the whole system. They should drive improvement at every level. Closing the plan-do-check-act loop is the only way to ensure the PTW system remains effective.

## REFERENCES

- HSE 1997, Successful Health and Safety Management (HSG65) HSE Books 1997 ISBN 0 7176 1276 7.
- HSE 2005, Developing Process Safety Performance Measures, Guidance Notes Version 6, March 2004, HSE, Hazardous Installations Directorate.
- HSE 2005, Guidance on PTW Systems, A Guide for the Petroleum, Chemical and Allied Industries, HSG 250, HSE Books 2005.
- HSC 1997, Oil Industry Advisory Group, Guidance on Permit to Work Systems in the Petroleum Industry, HMSO 1997 (3rd edition) ISBN 07176 181 3.
- HSE 1997[2], Successful Health and Safety Management (HSG65) HSE Books 1997 ISBN 0 7176 1276 7.