Safety practice

Shift handover

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Summary

Poor communication at shift handover was identified as one of the causes of the Piper Alpha disaster. The operators decided to start the standby condensate pump but did not realise its relief valve was not in place. The inquiry into the disaster found no evidence to suggest that the people involved had done this intentionally and concluded that they made decisions that, in hindsight, were clearly wrong because they did not have a full and accurate understanding of equipment status and condition.

Unfortunately, in the 30 years since Piper Alpha there has been relatively little effort put into improving shift handover across industry. This is despite subsequent major accidents where problems with shift handover failures have been identified.

This paper summarises the issues of shift handover and the challenges with achieving improvement. It refers to work carried out at a client's site to improve shift handover, which has had a very positive effect on shift workers and their managers.

Keywords: Shift handover, communications

Introduction

Shift handover is a communications task that involves information being transferred between individuals and teams to allow work to continue safely and effectively. It is a two-way process that involves:

- outgoing shift personnel preparing for, and then delivering the handover;
- incoming personnel receiving the handover and using the information they receive as required to do their job.

All forms of communication are complex and error prone, and shift handover can be particularly complex. One of the challenges is that the people on the outgoing shift have an incentive to complete the handover quickly so that they can go home; whilst people on the incoming shift need information to perform their job but do not know enough about recent events or current status to ask the most pertinent questions.

What happened at Piper Alpha?

The release of hydrocarbon condensate that caused the initial fire at Piper Alpha occurred because a pump was started whilst its relief valve was missing. Hydrocarbon condensate leaked from the flange where the relief valve was normally connected.

The removal of the relief valve had been controlled under a permit to work system, which included electrical and mechanical isolation of the pump. This prevented the pump from being started whilst the relief valve was missing. Unfortunately, the operators decided to de-isolate the pump so that it could be started.

Condensate Pump A had been isolated for a planned overhaul to be carried out. It was decided that this would be a good opportunity to remove its relief valve for maintenance. The pump overhaul would take several days whereas the relief valve maintenance and refitting would normally be complete within a shift.

However, things did not go quite to plan. The pump overhaul was delayed and did not commence on the planned day. Also, the relief valve maintenance took longer than expected so that it could not be returned within the shift. The problem was that these events were not properly communicated, and operators did not have a full understanding of the status of the pump and its relief valve. The actions they took were reasonable, based on their understanding, but were completely wrong based on the actual status.

Shift handover - a key cause of the disaster

The public inquiry into the Piper Alpha disaster concluded that the initiating event was Condensate Pump B tripping due to blockage caused by hydrate formation. This was a known problem and previous experience had shown that clearing a blockage could take some time. However, the platform needed to continually export condensate, which required one pump running. Without this facility it would have to shutdown, which was both expensive and created a high workload and some risk.

The criticality of condensate pumps to production was well known and so the design included a 'spare.' The intention was to run one as 'duty' with the other available to start if there was a problem. Hence, when Pump B tripped the operators would naturally have started to consider what they needed to do to start Pump A.

The inquiry found no evidence to suggest the operators would have ever considered starting a condensate pump with its relief valve missing. It concluded that operators on duty at the time (night shift) did not know that the relief valve on Pump A had been removed.

There appeared to have been two communication failures that occurred around the time of handover between day and night shifts:

1. Maintenance personnel did not communicate effectively that the relief valve had not been returned as originally planned. They returned a 'suspended' permit to work to the permit office, but did not talk to anyone about the work or inform about the delay;

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2. Communication at the operations shift handover meant that the night shift knew that condensate Pump A had been isolated in preparation for its overhaul, but the overhaul had not started. However, the removal of the relief valve was not communicated and so the night shift were not aware that it was, or could have been missing.

The conclusion was that a shift handover had taken place as some information about the plant status had been communicated (i.e. pump being isolated); but it had not been effective because other information (i.e. relief valve being removed) was not. This meant that the night shift operators made decisions when facing a potentially serious loss of production based on an inaccurate knowledge of plant status.

Analysing the shift handover process

Unfortunately, Piper Alpha is not the only major accident where failures at shift handover have been identified as a cause or contributory factor. More recent examples include BP Texas City and Buncefield; and it seems likely that poor communication has a greater influence on major accident and process safety risks than is formally recognised. The Health and Safety Executive (HSE) has, for a long time, highlighted shift handover as a significant concern under the banner of safety critical communication.

The process industry does seem to be aware of the issues but in the 30 years since Piper Alpha there seems to have been relatively little done to systematically improve shift handover. This is evidenced by the relatively few publications on the subject and the fact that many companies have yet to produce procedures that document the process. Where procedures have been developed they are usually focussed on recording information on a log sheet (or similar) rather than on managing the whole handover process.

The reality is that shift handover is a complex, high risk activity that is performed very frequently. We would normally try to 'engineer out' tasks with these characteristics, or at least automate them to reduce the potential for error. But this is simply not an option for shift handover. It appears to fall into the 'too difficult' category for many because it involves a lot of 'softer issues' around communication and behaviour, which may not be the natural domain for the engineers and technically minded people that make up most of the employees in the industry.

All human communication is prone to error, with the likelihood of error increasing significantly as the situation gets more complicated. Most people over-estimate their ability to communicate; usually based on a self-evaluation of what they say whereas the only important measure is what the people receiving the message understand.

There is some general guidance related to communication that can be applied to shift handover. For example[1]:

- It is not possible to transfer meanings from one person to another directly. Rather, the receiver creates meaning in his or her mind;
- Anything is a potential message, whether it is intended or not;
- The message received is the only one that counts;
- Taking the above together, unintentional meaning is likely and potential miscommunication is the norm;
- Communication requires effort by both parties to avoid miscommunication;
- Face-to-face communication is generally the most reliable (but still not infallible) because it allows immediate discussion;
- Written communication is generally less reliable because of this lack of immediate feedback.

There is also a very significant behavioural aspect. For shift handover to work effectively the people involved need to:

- be willing to say if they do not understand what they have been told;
- be willing to challenge what they have been told;
- be able predict what someone else needs to know;
- show that they are interested in what they are being told;
- make time for the handover.

No procedure or management system can address these issues directly. Whilst guidance can be provided to help people understand what is expected of them, there will be a requirement for continuous supervision and coaching to ensure bad habits are avoided and to drive continual improvement. Given the pressures of work, it is unlikely that this will happen automatically. Shift handover practices are likely to evolve over time. Sometimes this will result in improvement, but at other times short cuts and bad practice may be the result.

Improving shift handover in practice

Work carried out at a client's site has been very successful at improving the quality of shift handover. It started by expanding an existing procedure so that it covered the full handover process; and providing training for all shift workers.

A key message that emerged from this work was that shift handover is a continuous process, taking place across 24 hours of each day. It is much more than the 5 or 10 minutes where individuals from different shifts are on site together. It was identified that shift handover requires the following:

- a chronological log to be updated 24 hours per day;
- a period of preparation at the end of each shift, before the handover, including preparation of a handover report;
- a face-to-face handover;
- a period of cross checking at the start of each shift, after the handover, to review the information received;
- a team meeting where information collected at individual handovers is shared amongst the team.

People need to be guided about what information to record in the chronological log and handover report; and what to talk about during the face-to-face handover. Although lack of information is usually the main concern, attempting to record and communicate too much trivial detail can hinder the overall communication process. The types of event of most interest include:

- health, safety, environmental and security events;
- plant and process changes;
- changes to key operating parameters;
- changes of status of safety systems and alarms;
- abnormal operator or alternative operating modes;
- equipment faults;
- unexpected or unplanned events;
- critical messages from other teams or organisations including third parties.

Ultimately the requirement is to communicate to the incoming

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shift in a way that ensures they fully understand status and availability of critical equipment and systems; and that they know what they need to do during their shift with priorities.

It takes time to prepare for a handover. Personnel must be given clear instructions that they will take the time out to do this. This will include suspending any ongoing tasks and delaying control or other parameter changes before the end of the shift. Management need to make it clear that it is accepted that some production may be lost as a result, but that this is accepted because effective communication is seen as highly safety critical. The only exception would be where a hazardous situation emerges, which clearly will have to be dealt with. But if this has occurred it must be recognised that the handover process has been compromised and mitigation needs to be taken to minimise the associated risks.

One factor that will affect the effort required to prepare for a handover, and time required for the face-to-face is the experience of the incoming person. This includes their time in the job and whether they have been at work recently or returning from an extended absence. Unfortunately, the outgoing shift does not always know who is going to be relieving them.

The face-to-face element of the handover requires special consideration because it provides the best opportunity for information to be communicated. There can be a perception amongst incoming personnel that their role is simply to listen to what they are told. But this is not effective at making sure the correct meaning of information is properly transferred. The face-to-face handover must be an active dialogue between all involved, using other sources of information including the handover log and chronological log to provide structure. Distractions and interruptions during this phase of the handover can be highly detrimental, so the working environment needs to be considered when deciding where to carry out the handover. Everyone else in the organisation must know that they should never interrupt a handover, except during an emergency. Behaviours, including non-verbal communication, will influence the quality of communication. People are far more likely to take time and care when talking to someone who is clearly engaged and interested in what is being said.

The handover should include a formal, signed-for handover of responsibility. The outgoing shift need to confirm that they believe their relief has fully understood what they have been told and the incoming shift need to confirm that they have received the information they need.

Even where good systems are in place, no shift handover will ever be 100% reliable or effective. People starting their shift need to understand that they must take time to cross-check the information they have been given or understood. Also, a team meeting early in the shift provides an excellent opportunity to clarify and share information so that everyone has a complete and accurate understanding of what is going on.

Bespoke software packages are available that can support the handover process. These can be very effective if implemented well. However, they can only support a good system being applied by competent people; and do not replace the need for these elements.

Conclusions

Shift handover is a critical to safety. This was highlighted in the Piper Alpha inquiry (and a number of subsequent major accidents) but has not received the attention it deserves or needs.

There is a lot more to shift handover than people on different shifts spending some time talking about what has happened over the last few hours. It is a continual process and needs to be supported by good systems and carried out by competent people.

Work at a client's site has led to a significant improvement in the way shift handover is viewed by everyone involved and how it takes place in practice.This work involved:

- defining the shift handover process as being a continual process;
- explaining why it is important in managing major accident and process safety risks;
- defining the main elements of the handover, with particular emphasis on preparing for handover and the behaviours required during the face-to-face element;
- identifying circumstances where shift handover can be particularly difficult and needs additional consideration;
- working with shift workers to obtain their views and suggestions for improvement.

In this case success was judged by the way shift workers reacted. An immediate response was that people started to allocate time to prepare for handover, whereas in the past they had a tendency to occupy themselves with plant activities until the very last minutes of the shift. In fact, they determined that the suggested 30-minute preparation time was insufficient and that 45 minutes was more realistic and should involve an end of shift team meeting. The fact that the shift workers were prepared to do this not only confirmed that they fully understood what was at stake, but also that management were willing to support them in doing this.

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