Organisational Change: Learning from Experience

Lorraine Braben, Human Factors Consultant, LBC; Nick Morris, Senior Process Safety Specialist, Cristal Pigments UK.

The paper describes the design and implementation of a new Management of Organisational Change (MoOC) System at Cristal, an upper tier COMAH site. Organisational change is any change which affects the way in which people work and can be compared to Management of Plant and Process Change (MPPC). Although MPPC systems are well established in high hazard industries, MoOC systems are much less so. However, organisational change can have as significant an impact on safe operation of plants. Cristal decided to revise their MoOC system in 2016 to meet regulator guidance and address issues with their existing system. The paper details the development of the risk assessment and the workflow design, implementing an electronic system to facilitate the process. It describes the work involved to launch the system and the importance of support at a senior management level to make it successful. It also provides information on the metrics which have been developed to ensure the system is sustainable. Key learnings from the project have been documented as well as some examples of change management on site.

Introduction

Most organisations are in a constant state of change; business pressures will inevitably cause organisations to review their work practices, internal processes may change and, of course, there is always a turnover of personnel joining, leaving and moving within any business. All these changes need to be managed to ensure continued safe operation in a hazardous environment. This paper demonstrates how current regulator guidance can be practically applied and how it has been incorporated into the design and implementation of a 'Management of Organisational Change' (MoOC) system at Cristal Pigments UK. It aims to share the authors' learnings from this project.

At the time of initiation of the project, the authors both worked for Cristal. Lorraine Braben was the Human Factors and Competence Superintendent, and Nick Morris was the Senior Process Safety Specialist.

Cristal (also known as The National Titanium Dioxide Company Limited) operates eight manufacturing plants in seven countries on five continents and employs approximately 4,100 people worldwide. Cristal operate an upper tier COMAH site at Stallingborough, located on the south bank of the Humber in North East Lincolnshire. The site manufactures titanium dioxide (TiO_2) pigment, a bright white powder made from titanium ore. It is the largest volume TiO_2 production facility in Europe.

At the Stallingborough site there are around 330 professional, technical and craft employees involved in the development and manufacture of TiO_2 pigment. In addition, the site regularly works with approximately 150 contractors across a range of services using local, national and international companies. The site has been in operation since 1953 and has inevitably changed significantly since that time.

Organisational Change Theory

What is Organisational Change?

Organisational change is any change that will affect the way in which people work and can have an impact within the business. Examples include reduction in staffing levels, de-layering, outsourcing or changes to key personnel. In the same way that plant and process changes require management and risk assessment, changes that impact personnel in the business also need the same approach to avoid undesirable hazardous consequences.

Whilst 'Management of Plant and Process Change' (MPPC) systems have been well established and practised for many years, similar systems for MoOC are not so commonly implemented. Whilst the perception is that MPPC and MoOC are very different, they have a great deal in common. Process change is often regarded as being more predictable with the different elements within the process being clearly defined, compared to organisational change which is associated with the variability of human beings and therefore not defined. However, HR systems have developed considerably and there are clear expectations that high hazard industry will have definitions of the necessary competences required to run the business. As a result, the information is available to identify issues associated with organisational change. Organisational changes, such as a resignation or illness, may not always be predictable and may be seen as outside the control of the organisation; yet unplanned outages or breakdowns on plant are still managed appropriately. Just as changing something on plant can have seriously affect plant operation, organisational changes can have a significant impact on the safe operation of a site and should be assessed as rigorously as process changes.

Why Manage Organisational Change?

Issues can arise when the impact of organisational change is not fully considered.

Often, responsibilities are passed on to personnel who do not have the experience to fully understand the implications of the new role. Whilst people need to learn and develop, they are often left unsupported during this phase.

Change can be stressful, especially if people feel that they have no input or control over what is happening. This can create pressure to comply, either real or perceived, and as a result, people do not challenge organisational decision making or the processes being followed.

Other organisational changes, such as the implementation of new software systems, are often seen as a technical project and, whilst training may be provided, the other impacts on the way in which people work and their level of competence may be

overlooked. Often, the time required for people to learn a new system can take them away from other workload which may be safety related.

Outsourcing can also impact the organisation's ability to understand and manage the affected system or facility. Whilst the focus is on being more cost effective, the responsibility for the outsourced activity always remains with the business, not the contractor. The business must therefore retain an 'intelligent customer capability' to meet its obligations.

Expectations for Managing Organisational Change

The Health and Safety Executive (HSE) have clearly stated their expectations for managing organisational change for all high hazard sites. Similarly, regulators for other industries such as Nuclear, Rail and Health have all issued guidance on managing the risks from organisational change.

For COMAH sites, a demonstration is required that all direct and indirect effects of the change on the hazards associated with the site are identified and risk assessed. The HSE have provided guidance on the approach to take in addressing organisational change in Chemical Information Sheet No CHIS7. HSE's Human Factors Delivery Guide for COMAH Establishments and the Safety Report Assessment Guide: Human Factors reiterate the requirement to follow CHIS7. This outlines three key areas of work:

1. Get organised
    - Have a strong policy
    - Make senior-level managers accountable
    - Have a clear change management procedure
    - Communicate and include everyone
    - Review and challenge
2. Risk assessment
    - Identify the people involved
    - Identify all changes
    - Assess the risks
    - Consider human factors, competence and workload
    - Test scenarios
3. Implementing and monitoring
    - Provide enough resources to make the change safely
    - Monitor risks during change
    - Keep your plan under review, track actions
    - Monitor performance after change
    - Review your change policy

It can be seen that this is not so different from the principles around managing other types of change.

COMAH sites are expected to have a high level of reliability in the planning and decision making of changes. It is worth considering how decisions taken in a department which is not seen as front-line operations can be wide ranging and impact the behaviours and culture across the whole site. An example which has affected much of industry in the last decade is the closing of final salary pension schemes. In organisations with an ageing workforce, many experienced workers retired earlier than expected as they saw no benefit to their pension by staying. Such significant changes to workforce demographics can result in a reduced capability to manage critical operations.

All changes should be planned in a thorough, systematic and realistic way, as would be done for process changes. The planning should consider actual capabilities, not what is assumed to be the case. Key tasks and responsibilities need to be identified and reassigned. The planning should include consultation with those affected by the change as far as possible, including contractors.

The risk assessment should consider not only the outcome of the change but also the transitional phase as the change is being implemented. The business culture should encourage people to challenge the plan if the risk assessment identifies unacceptable risks which have not been addressed.

When the change is implemented, there should be training and support from experienced staff for those people taking on new roles and responsibilities.

Change may be instigated for many reasons, often not within the control of the site. However, the expectation is that a site should be aware of the changes that are going on and should limit the number of changes occurring simultaneously to ensure that each individual change and the effects of cumulative change are being managed effectively.

As well as understanding the risks of implementing a change, there may be hazards arising from not implementing changes. If a company does not address the risk of a long-term absence, for example, there will come a point when the risks associated with doing nothing outweigh the risks of making changes.

Relevant Process Safety Incidents

There have been a number of high profile process safety incidents where investigations have demonstrated significant failures in MoOC. These are summarised below.
Bhopal (1984)

- A leak of methyl isocyanate gas was released from a storage tank, causing widespread exposure to the inhabitants of the surrounding towns. Departure of personnel over time leading to a lack of skilled operators contributed to this event as did cost reduction measures which resulted in safety management systems being reduced or removed.

Hickson & Welch (1992)

- A company reorganisation led to an inexperienced team being given the task of cleaning a vessel containing a potentially unstable sludge. The resulting fires killed five workers on the site. The team reported into a senior manager whose workload left little time to offer support.

Esso Longford (1998)

- A major fire and two fatalities resulted from a ruptured pipe. A previous reorganisation had removed senior technical support personnel from the plant to the Melbourne offices leading to limited plant surveillance.

BP Texas City (2005)

- Staffing cuts at the Texas City refinery meant that there was only one control room operator to manage the start-up of three complex plant units. Poor understanding of the process condition lead to a major explosion killing 15 workers.

History of Management of Organisational Change at Cristal

The Cristal site at Stallingborough has had a system for managing organisational change since 2007. The system was originally designed based on the principles in the HSE document, CHIS7. This was designed to be a high-level review conducted by the Senior Management Team. It was originally implemented as a paper-based system and considered both safety aspects of the change and also business implications, such that the review became quite lengthy. It was not widely adopted and was not supported to the same degree as the MPPC system. It was also difficult to keep track of the documentation as it was passed through different managers for approval and documents went missing.

In 2012, an electronic form was introduced based on the original. There were concerns about confidentiality due to the nature of some of the changes. The electronic system was public access which affected what managers were prepared to put into it. The revision also put responsibility for the risk assessment on the individual line manager who initiated the change, as this was already happening informally. It removed the business impact assessment to put emphasis on the safety aspects and reduced the workload for Senior Managers.

In 2015, the MoOC system was again reviewed, with the intention of simplifying the risk assessment, removing the checklist and relying on the experience of the manager to understand what risks needed to be managed. This review reverted to a paper-based form which would be completed and then scanned and saved electronically.

Problems with the 2015 System

It became clear very quickly that the revised system was not identifying key issues and was not being used. This led to a new piece of work to address the MoOC system in 2016.

There were some significant problems with the use of the MoOC system.

One of the main issues was that the system was not enforced and it had become custom and practice to deal with the MoOC "paperwork" retrospectively if at all, rather than carrying out a proactive risk assessment of the change.

Little training had been delivered at the previous review to inform people how the system was meant to operate. A presentation had been given to those senior managers in position at the time the revised system was launched in 2015. This was not made available to those line managers who were delegated to carry out the MoOC risk assessments.

There had been significant changes within the senior management team since the 2015 MoOC review. However, those new members of the team had not received the presentation on the system.

The revised procedure was brief and did not provide sufficient guidance to the system. It was not clear under what circumstances the MoOC should be raised; process safety critical roles and responsibilities were not defined. Additionally, people stated that they were not clear on the definition of which types of changes required a MoOC.

Many people saw the system as a means to ensure that the change was being managed as a logistical exercise, e.g. ensuring that a new starter would be registered for a PC or laptop. There was no clear understanding that the purpose of the system was to provide a risk assessment of the change and its impact on the major accident hazards to determine if it should be progressed.

Because the site had reverted to a paper-based system, albeit saved electronically, it was difficult to extract data to determine if the system was performing as required.

The site was also going through a high volume of change at all levels of the organisation and focus on the MoOC process had been lost. The irony of this situation was recognised and the site initiated a further review of the system.

Considerations for the 2016 Review

The main requirement in reviewing the system was to establish a system which was fit for purpose, i.e. supported personnel to complete a thorough risk assessment, and which was simple to use.

The site wanted to demonstrate that all changes had undergone a risk assessment of some sort to remove the debate about whether the change in question actually came under the MoOC system or not. This would include major organisational changes, such as restructuring, to new system implementation, to shift moves. Shift moves were always a major cause for discussion as they were considered 'like for like' yet could have a major impact on safety critical roles and emergency response provision for each shift.

It was also necessary to emphasise that this was a risk assessment that needed to be done before any planned change was implemented. It was intended to apply the same rigour which was in place and accepted for the process change management system.

The new system would need to be electronic to make the approval process more efficient and to ensure that all documentation was retained.

It is outside the scope of this paper to discuss the psychological effects of change management in any detail. However, it was recognised that change can have a major impact on how people feel and behave. All previous versions of the MoOC system had concentrated on the practical aspects of the change. As the site was progressing well with Human Factors, it was decided to introduce the effect of change on human reliability by including a consideration of the impact on Performance Influencing Factors (PIFs).

In redesigning the system, it was necessary to ensure that the appropriate prompts, or question sets, were included to conduct a thorough, systematic and realistic risk assessment to meet the regulator's expectations but it needed to be user friendly and not seen as too onerous. It also needed to be relevant. In reviewing the changes which had occurred over the previous 12 months, it became obvious that there were many different types of change which each had different assessment requirements.

Again, to meet the HSE guidance and Cristal's own global procedure requirements, it was necessary to define the actions which would need to be completed before the change was implemented, and those which were a lower priority and could be done after the change took place.

The Risk Assessment

Having identified the problems with the previous system and determined what needed to be considered in the revised system, a review was undertaken of all the changes that had occurred on site over the previous 12 months. It became obvious that there were a number of distinct types of change requiring risk assessment. These were categorised as follows:

- Starter/Leaver
- Job Rotation
- Secondment
- Long Term Absence
- System Change
- Organisational Restructure
- Internal Role Change
- Shift Moves

Defining the Risk Assessment

The first step was to define what came under the MoOC process. In principle, everything should have some level of risk assessment, if only to determine that there was no evident risk from the change. Therefore, all organisational changes would initiate the MoOC process.

The first part of the risk assessment is a set of 12 screening questions developed to meet the site's requirements. These focus predominantly on the areas which may affect Safety, Health and Environmental Management systems, including the Major Accident Hazard risks and include questions such as:

- Does the change impact a safety critical role?
- Does the change impact Emergency Response arrangements?
- Does the change impact responsibilities within the Safety, Health & Environmental procedures and instructions?
- Does the change impact any unique or specialist knowledge within the company?

The questions are consistently phrased so that a 'Yes' answer indicates that a potential risk has been identified and needs to be assessed. If this is the case, then more information is requested to detail what is affected. If all the answers are 'No' then the form is submitted for approval and the change can be authorised to proceed. No further assessment is required

It can be seen that this is a simple and quick process to ascertain that the change does not require further risk assessment.

If, however, any question is answered 'Yes', then it will enter the next part of the assessment. Having selected the change type based on the list above, there are four different question sets which need to be addressed:

- General questions for all change types ask for information regarding responsibilities, resources and outstanding actions which are relevant to all changes.
- Where a screening question has been answered 'Yes', then further information about that issue is requested.
- The electronic form displays a specific question set addressing the concerns for the type of change selected. For example. For a 'Starter/Leaver' change type, the questions will be concerned with managing the induction and transition into a new role. For a 'System' change type, the questions are more concerned about how changing the system will affect people's behaviour.
- Questions on PIFs related to the specific change type identify concerns with the impact on individuals or groups. The PIFs considered are shown in Table 1:

Table 1. Performance Influencing Factors to be considered as part of MoOC.

PIFs	Description
Task Factors	The number of tasks associated with a change and how complex they are, which impacts the time to learn them and the degree of effort required to manage them, both physically and mentally. Factors associated with workload and other responsibilities and how people may cope under time pressures.
Communications Factors	How communications will be managed, the amount of communication required as a result of the change (possibly for an individual within their role). Does the change impact on the equipment, affecting quality or reliability? Consider the use of jargon, inconsistent terminology or standards, and accents and understandability.
Procedure/ Documentation Factors	The degree to which processes and activities are documented, how accessible they are and how usable. Consider the number of procedures which a person may be expected to follow and/or learn, how accurate they are and the level of detail that they provide. Are relevant procedures compatible with other documentation in place?
Training/ Experience Factors	The availability and quality of training, whether or not it is suitable for what will be required in the future, and competence assessment requirements. Consideration of mentoring and the level of experience of those involved in the change.
Human-Machine Interface Factors	The impact associated with the interaction of IT or automated systems and also the transfer of information. Consider accuracy of information, the way in which it is presented and accessed, the format so it is usable, and the quantity of information to be managed. For the interface with IT systems, consider reliability and resultant trust in equipment, the allocation of functions between person and machine, the physical ergonomics of the design and quality of the display and warnings/alarms. It may also be appropriate to review the impact on the workplace arrangements.
Personal Factors	Factors associated with the individual and may cover more than work related issues. Consider alertness and fatigue, stress, morale and job satisfaction, domestic issues and arrangements, and physical and mental health. Consider how these factors may impact the risk associated with the change.
Social and Team Factors	How the team interacts and the impact on the social aspect of group dynamics. Includes quality of team co-ordination and supervision, team relationships and trust, co-ordination between teams and the degree to which members will assist and support each other.

The risk assessment must consider both the risks arising following the implementation of the change AND the risks during the transition phase of the change process. The system requires a risk rating to be considered for each condition.

When considering change, doing nothing can be more hazardous than the alternatives. Therefore, the risk assessment was designed to ask for an explanation of any risks associated with not making a change from the current situation.

By answering each question of the risk assessment, a risk rating was to be allocated to each question. It was decided to keep this very simple and remove the potential for subjective judgements. Therefore, the following principle was applied:

LOW   No issues or concerns are identified or the question is not relevant to the change.

HIGH   The question is relevant to the change and the risks identified will need to be managed.

For every HIGH risk item identified, the risk assessment requires an action to be raised or an explanation of how that risk is being managed already.

Issues Associated with the Risk Assessment

When considering the risk, it is important to understand what responsibilities sit within a role and what sit with an individual. Some people take on informal responsibilities which are not necessarily documented or well-known. However, they could have a significant impact if they do not get identified and actioned. Additionally, some people may have secondary role

responsibilities in addition to their primary role. For example, an operator's job role may cover a specific area; they may also be a First Aider for the shift.

The Risk Assessment must be a consultative process involving the people affected by the change (or their representatives), their line manager(s) and other support personnel who have a good working knowledge of the work processes affected by the change. It is important to capture the details of current activities to ensure that they are fully considered. This may be that there is a conscious decision not to continue with them but with the full understanding of the implications of that decision.

Including a consideration of PIFs in the risk assessment process was seen as a significant development of the MoOC process for Cristal. Whilst there was some hesitation about the level of understanding on site, it was felt that the prompts from the questions would help people to think through some of the wider issues which may not have been identified previously.

Design of the Workflow Process

Foundations of the New System

The detailed requirements of the risk assessment described above were built into an electronic system, developed by Cristal personnel. The system comprises a library of Infopath forms, one per MoOC, built on a Sharepoint platform, and with email functionality to notify individuals of requirements to progress the workflow. The form would only open the relevant sections of the risk assessment dependent on the selections made. Early demonstration of the form was positive but indicated the need to develop and clearly define the associated workflow and the wider system for assessing and managing organisational change and actions arising from this.

The site already had a mature MPPC system, well established, robust and most importantly, fully accepted as a mandatory process. Whilst the suite of MPPC forms was not deemed suitable for organisational change, most aspects of the established workflow were felt to be very applicable. It was thought that using a common approach would be very beneficial in the adoption of the new system.

Cristal has a global Process Safety Standard which defines 14 elements, one of which is Organisational Change Management. For each element, sites are required to nominate a sponsor and promote initiatives to improve performance. Within this framework, the HR Manager was clearly defined as the champion for this project.
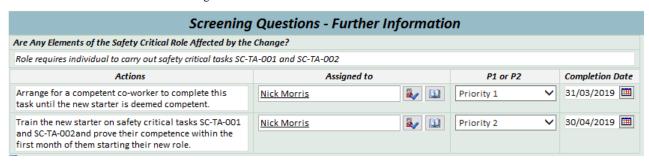
Definition of roles (who does what) and workflow steps (and when) was included as guidance in a revised site MoOC procedure and formed part of the initial training materials.

Identification of Workflow, Roles and Responsibilities

A summary of the main steps in the workflow is provided in Appendix 1. Supporting comments:

- On initiating the MoOC, the screening question set as described above is completed for all changes to determine if a detailed risk assessment is required or not. The MoOC is then submitted to Human Resources (HR) for First Stage Authorisation.

- First Stage Authorisation is a 'gatekeeping approval' and confirms that HR are aware of the change and are satisfied that it does not introduce new or increased risk to the business. If not satisfied, the MoOC can be rejected or placed on hold pending clarification from the Initiator.

- Risk Assessment follows First Stage Authorisation and requires completion of the four different question sets and actions assigning where high risk items are identified, as described previously. The MoOC is then submitted for Second Stage Authorisation.

- The MoOC requires Second Stage Authorisation by Senior Managers who are confirming that the appropriate risks have been identified and that the actions are adequate to manage those risks. If not satisfied, the MoOC can be rejected or placed on hold as for First Stage Authorisation.

- All the actions identified in the risk assessment are uploaded to and subsequently managed via the site's Action Tracking system. Once this is confirmed as done by the relevant line manager, HR complete necessary payroll and other personnel changes if required. The MoOC form can then be marked complete.

- Actions are prioritised, with Priority 1 (P1) actions needing to be completed prior to the implementation of the change. Priority 2 (P2) actions are considered less critical to have in place immediately and are completed in accordance with the agreed target, ensuring no detrimental safety implications arise as a result of the action remaining outstanding.

  o For example, a person undertaking a new role does not currently have the skills required to undertake a Safety Critical task. A P1 action would be to arrange for a competent co-worker to complete this task until the new starter is deemed competent. A P2 action would be to train the new starter on the new task and prove their competence within the first month of them starting their new role. Figure 1 shows how this would typically be captured on the MoOC form.

Figure 1. P1 and P2 actions on the MoOC form.

Key roles and responsibilities:

- HR have overall ownership of the process and provide First and Second Stage Authorisation of individual MoOCs. A MoOC Steering Committee has been established and meets monthly, chaired by the HR Manager.

- Departmental/ Functional Managers are accountable for ensuring that MoOCs are raised for any changes affecting their department, responsible for participating in the MoOC process (or nominating an appropriate delegate) and providing Second Stage Authorisation of MoOCs.

- Line Managers initiate the MoOC process when a change impacts their area, complete the initial screening questions, set up and lead the MoOC risk assessment process, ensuring that the right people contribute to the process, ensure that MoOC actions are completed in a timely manner and the MoOC is closed according to plan.

- Process Safety are responsible for the overall management, review and support of the MoOC process and providing Second Stage Authorisation of MoOCs.

Launch of New System

Training

The new system went live in September 2017. Initial training was targeted at all users of the system, including those who would be carrying out the assessments, those reviewing and approving the assessments and those with an administrative role within the MoOC system.

A formal training package was developed, which covered aims and objectives, scene setting (where we are), restatement of the reasons for organisational change assessment, types of organisational change, how to access the database, a walkthrough of the workflow, worked examples, opportunities to try it out and expectations going forward.

Ongoing arrangements for training cover those new to the MoOC roles, who receive initial training based on that delivered at the launch of the system. Information updates for existing users are delivered periodically in response to form, system or guidance updates, following Steering Committee reviews of performance or as particular issues arise.

Single topic flyers have been adopted from the Occupational Safety field. They provide a vehicle for clearly and concisely communicating the key learning points regarding a particular topic. Visually impactful, maximising colour and images and restricting textual content, flyers are deployed to all system users via email and/ or site noticeboards. Examples of topics have included when to raise a MoOC, changes to the form and assessing more complex changes.

Refresher training was rolled out to all users of the system in 2018, approximately 12 months after launch. This was delivered as a computer-based package and comprised a presentation and question set. Topics included basic principles, detailed guidance on completing a MoOC and each of the workflow steps, and specific issues arising from the first year of operation.

Communication

Communications about the new system took place at various stages ahead of, during and following launch. Integration of the message within existing site communication vehicles was the main strategy. This included the main site monthly brief and associated safety content, delivered to all personnel, with site safety-related committees providing the opportunity for more detailed discussion and buy-in from senior management, line managers and workforce representatives. Feedback from these forums was used to refine the forms, workflow and guidance ahead of launch, and subsequent improvements.

Key Ingredients for a Successful Launch

Any new business system will affect different users or stakeholders in different ways. The initial experiences and introduction to the system are likely to set the expectations going forward. Key ingredients for success are:

- Make buy-in from the top visible through engaging and seeking commitment from leadership early. Support and stress the importance of the new system in top-down messages.

- Engage affected personnel throughout the launch: before, during and after. Involvement of key personnel at an early stage, through development and well ahead of a wider launch can help to identify potential issues, address fears and promote the benefits of the change from within the affected workgroups.

- Ensure sufficient time for training and live testing. Initial training needs to cover both the mechanics of any new system and the purpose and benefits of the change. Opportunities to test, practice and role-play allows individuals to gain confidence in a safe environment. Access to system 'expert' support following completion of training allows resolution of individual concerns and knowledge gaps.

- Provide support and resources to address uncertainties, such as pocket guides, posters, access to training resources, process flowcharts and procedures.

- Plan for expected problems and challenges. Engage key users throughout the design and roll-out phases to develop strategies for identified problem areas.

What Went Well?

The general approach to the change from potential users showed a willingness to engage with the new system. Honest, open discussion at training, briefings and other communication opportunities was welcomed, noted and acted on throughout.

Individuals were provided with ready access to the MoOC system via hyperlinks and shown how to access it at the initial training sessions. IT issues were minimal during this initial phase; prior testing with fictional and actual example changes was used to identify and resolve any problems. The use of Sharepoint and Infopath has provided tremendous flexibility in further improvement work, eliminating the restraints of an off-the shelf commercial product.

Initial training had clearly defined aims and objectives and was designed to promote questions and provide an early hands-on opportunity. The interactive nature of the sessions highlighted issues not previously considered; for example, some of the on-screen guidance was refined to improve readability. Figure 2 provides examples of on-screen guidance. Feedback from the training was used to iteratively improve the sessions.

Figure 2. On-screen guidance.

What Could Have Been Better?

Mapping out of the workflow and adoption of the MPPC model was not made a priority until quite late in the development of the MoOC forms. As such, early demonstration of the intended usage and routing highlighted that the form did not have all the desired functionality at that time. A delay in launch date was required while the workflow was developed and agreed, and further programming and testing carried out to make sure the form worked as intended.

It was originally planned to launch in early summer 2017. Delays described above forced an over-run into peak holiday season, which then led to non-availability of key interested parties for training and briefing. Lessons can be learned from this about the timing of any new system, both in terms of seasonal effects and other organisational priorities affecting availability of key personnel.

Although many of the aspects of what is considered to be good practice were considered and included in launch activities, more could have been done. More dedicated resourcing of training, testing and promotion, and hands-on support for those undertaking their first MoOCs in the new format may have helped adoption and address uncertainties. Most of those involved in ensuring the success of the launch had numerous conflicting responsibilities.

Following launch, the site required a number of recent changes that had not been subject to a MoOC to be assessed retrospectively to ensure no residual risk. This could have led to greater understanding of the new system but in many cases was not felt to be beneficial and led to some frustrations.

Support and Resistance

Support

Support for the MoOC programme has been evident from its launch in 2017 through early adoption, refinement and ongoing use today. Key stakeholders have been invaluable in delivering our successes to date.

Every successful business initiative needs a champion to promote it and involve the organisation's leadership. In our case, this role has been fulfilled admirably by our HR manager. Visible, enthusiastic and engaged at all stages from development to current steering, his support has provided a blueprint for any new programme.

Promotion by the HR Manager has been mirrored by the HR team, providing ownership and effective administration of the system. Use of existing HR line management forums have helped promote the MoOC message and continue to provide the radar that captures forthcoming changes requiring assessment, ensuring this is done in a timely manner.

Other members of the Senior Management team have similarly provided support and consistent direction within their departments, ensuring all changes are screened and, where necessary, risk assessed. Regular performance reporting and metrics (see below) highlight areas requiring focus.

For this project, the IT programming resource has come from within the site, using individuals with enthusiasm, interest and creative flair rather than traditional IT qualifications. These individuals have been involved in previous organisational change, and this practical end-user experience has been invaluable in working through functional, structural, layout and content queries arising from building the form, system and workflow.

Individuals react to change at different rates and in different ways. A number of 'early adopters' of the new MoOC programme were identified, and their views proved tremendously useful in ironing out initial concerns, obtaining feedback on progress and seeking to engage the majority of the user population, and any resistors.

Resistance

Implementation of any new system in an organisation will inevitably encounter resistance along the way. Resistors may be influential and able to delay or block adoption of the new system. Examples from this project include individuals not recognising the benefits of the new assessment process, considering themselves to be too busy to take on additional duties, or failing to raise concerns.

Our response has been to work directly with individuals wherever possible to allay their fears. Opportunities have been provided to seek feedback and concerns and address any justified issues proactively. This process has continued throughout, recognising that concerns may change over time. Training and guidance have been revised and recommunicated based on lessons learned; there have been a number of upgrades to the form and Sharepoint interface to improve and simplify access, and provide the views that people need.

Traditional models of psychology of change and individuals' differences when faced with change have been recognised by the MoOC steering team in providing a supporting and empathetic approach throughout the launch, subsequent adoption and eventual embedding of the system. It is worth emphasising that experience has shown that resistance can persist long into the life of any new system. Sustained commitment and passion have been required to overcome such challenges.

Ongoing Monitoring and Metrics

Process Safety Performance Indicators (PSPIs)

Measuring performance to assess how effectively risk are being controlled is essential within process safety management, and organisational change is no different to other elements in this respect.

Good measures give an indication of the health of any system, ensure that key aspects are being undertaken as intended and desired outcomes are being achieved. Selection of the right indicators is vital to provide confidence that risks are being controlled. PSPIs should be clearly understood and relatively straightforward to collect on a regular basis.

The Cristal Stallingborough site employs a combination of global and local measures in this respect:

Global measures are reported monthly, provide a means to compare separate sites within the Cristal organisation, but are of limited use locally:

- Number of personnel in the MoOC process: Whilst personnel change is good for an organisation, too much change at the one time, can lead to gaps in experience and knowledge transfer. This metric is an attempt to manage how much change is 'enough'.

- Overdue actions per number of personnel currently in the MoOC process: Knowledge transfer and training for personnel in the MoOC process should be completed in a timely fashion.

Local measures are similarly reported routinely for senior management review and provide a readily available means of targeting resource where issues need prompt resolution. These measures are dynamic, and subject to review by the Steering Committee. Those currently used include:

- Number of Open MoOCs, this is equivalent to the global measure 'Number of personnel in the MoOC process'.

- Number of Open Safety Critical MoOCs: a measure of degree of change within safety critical roles, which form a subset of the site population.

- Number of MoOCs raised and closed out in the previous month: a further measure of the degree of change across site.

- Number of organisational changes implemented without a MoOC: potentially the most direct measure of risk not being controlled.

- Number of 'slow moving' MoOCs: those which have been raised but not progressed to completion within the defined time period.

An Example of Impact on Organisational Decision Making

It was proposed to combine two operating positions, the nature of which had changed over time due to several process changes and automation projects. Consultations with the individuals affected, management and employee representatives supported the proposals and a MoOC was carried out well ahead of the proposed implementation date to assess the impact. Each of the existing positions carried out safety critical tasks, including start-up, shutdown, isolation and lockout of process plant, and defined responses to hazardous scenarios. The MoOC therefore identified a need to carry out a human factors review of the tasks and existing task analyses in light of the new proposed ways of working. An appropriate P1 action was raised and this was carried out. This verified the previously held view that the proposal was workable under steady state conditions. However, many new issues were highlighted, including certain situations where the individual would need to be carrying out duties on separate plant areas simultaneously, and delayed response actions to process upset and other hazardous conditions. The site felt that this would introduce unacceptable levels of risk into the operation and it was decided not to proceed with the change.

Conclusions

Many of the lessons we have learned in the development, launch, adoption and refining of the new MoOC system have been discussed in the previous sections of this paper. Key findings are summarised below:

- The screening process provided a simple tool to ensure that all organisational changes are considered for further assessment and eliminated the debate over whether a MoOC is required.

- Identification of the type of change enabled the risk assessment to be thorough but focus on potentially relevant issues.

- Incorporating PIFs into the risk assessment has provided a means to consider the psychological aspects of a change, although it requires further education with line managers to help them to manage these risks better.

- Using an approach common to both MPPC and MoOC in the design of responsibilities and the workflow process was very beneficial in the adoption of the new system. It provided consistency and showed that organisational change was being managed with the same degree of rigour as plant changes.

- Clear definition of expectations, roles and responsibilities, with strong championing and ownership of the system have helped drive through initial adoption and performance improvements.

- Launch of the new system was well resourced, with communications, training and support materials prepared and refined. Availability of key influencers was essential in ensuring successful adoption.

- Using an electronic system, such as Sharepoint, has streamlined the workflow, enabled robust management of multiple organisational changes and ensured that documentation is retained, easily accessible, and available for future reference.

- Selection of good, meaningful and readily derived metrics has been invaluable in enabling us to monitor the health of the MoOC system and drive performance improvements.

- Changes have been implemented through the life of the system to date and it will continue to evolve looking ahead. There is a willingness to look for improvements, asking for and acting on suggestions. The scope of the system has broadened a little, to include more business risk considerations as well as the core safety critical aspects.

- There have been challenges along the way. Consideration of how to address cumulative change, complex organisational changes and confidential matters have prompted the steering team to review, revise and develop guidance, and communicate to users in a spirit of continued improvement.

Now, nearly two years on from launch, the site has an effective MoOC system that is world class. It meets the expectations of the HSE for COMAH sites and does so in an efficient way. The system is user-friendly and allows monitoring of performance which highlights risks and challenges, and supports our decision making. Having built the electronic system in-house, it is easy and cost effective to make improvements. Constant commitment to the process from senior management, HR and process safety subject matter experts has been required to create a sustainable and embedded system. A step change in management of organisational change has been achieved at Cristal.

Organisational change is similar in many respects to any other workplace activity. Failure to carry out a risk assessment before the activity takes place can result in undesirable hazardous consequences.

References

Brazier, A., 2014, Organisational Change, Loss Prevention Bulletin 239.

Gray, K. and Wilkinson, J., 2016, Managing Organisational Change. In Edmonds, J. (Ed) Human Factors in the Chemical and Process Industries, Elsevier Inc.

Hopkins A, 2000. Lessons from Longford: The Esso Gas Plant Explosion, CCH Australia, 2000. ISBN-1-86468-422-4

HSE, 1994, The Fire at Hickson & Welch Limited. A report of the investigation by the Health and Safety Executive into the fatal fire at Hickson & Welch Limited, Castleford on 21 September 1992, ISBN-0-71-760-702 X.

HSE, Wright, M. 1996, Business Re-engineering and Health and Safety Management Best Practice Model. http://www.hse.gov.uk/research/crr_pdf/1996/crr96123.pdf (Accessed 15/01/19)

HSE, 2003, Organisational Change and Major Accident Hazards. Chemical Information Sheet No CHIS7. http://www.hse.gov.uk/pubns/chis7.pdf (Accessed 15/01/19)

HSE, 2016, Inspecting Human Factors at COMAH Establishments (Operational Delivery Guide)

HSE, 2018, Human Factors: Organisational Change. http://www.hse.gov.uk/humanfactors/topics/orgchange.htm (Accessed 15/01/19)

HSE, 2018, Safety Report Assessment Guide: Human Factors. http://www.hse.gov.uk/Humanfactors/resources/safety-report-assessment-guide.pdf (Accessed 15/01/19)

FP Lees, 'Loss prevention in the process industries – Hazard identification, assessment and control', Volume 3, Appendix 5, Elsevier Butterworth-Heinemann, ISBN 0-7506-7589-3, 2005.

Nuclear Safety Capability Working Group, 2014, Nuclear Baseline and the Management of Organisational Change: A Nuclear Industry Code of Practice. Prepared on Behalf of the Nuclear Industry Safety Directors Forum by the NSCWG. http://ni.seniortest.co.uk/write/MediaUploads/SDF%20documents/NICOP_nuclear_baseline_and_MoC.pdf (Accessed 15/01/19)

Office for Nuclear Regulation, 2018, ONR Guide: Organisational Change, NS-TAST-GD-048 Revision 5. http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-048.pdf (Accessed 15/01/19)

Office of Rail and Road, 2018, Common Safety Method for Risk Evaluation and Assessment. Annex 4: Guidance on Organisational Change. http://orr.gov.uk/__data/assets/pdf_file/0006/3867/common_safety_method_guidance.pdf (Accessed 15/01/19)

US Chemical Safety & Hazard Investigation Board, 2007, Investigation Report Refinery Explosion and Fire, BP Texas City, Report No. 2005-04-I-TX

Appendix 1: MoOC Process Flowchart

Initiation of MOOC
(relevant line manager)

- Organisational change required
- Initiate the MOOC process
- Complete initial screening questions ← Review and address Concern Item
- Full MOOC assessment required? — No / Yes
- Identify Change Category
- Submit for first stage approval

First stage authorisation (HR)

- End ← Reject — Review and acknowledge change — On hold → Create a Concern Item
- Approve

MOOC Assessment of Risk
(relevant line manager)

- Convene MOOC risk assessment team ← Review and address Concern Item
- Complete MOOC risk assessment
- Submit for second stage approval

Second stage authorisation (Dept manager/ PSM/ HR)

- End ← Reject — Review and acknowledge change — On hold → Create a Concern Item
- Approve

Action Tracking and Closure
(relevant line manager)

- Confirm actions added to task tracker or no actions required
- Notify HR Services team for SAP changes
- Mark MOOC form closed
- Complete P1 actions and close out on tracker
- Implement change → Complete P2 actions and close out on tracker → End