Safety practice

Successful management of change involving closure of three chemical plants

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Introduction

This article describes the approach taken to manage and coordinate the safe transition of three plants from operations through to a care and maintenance (C&M) regime, together with a consequential redeployment and retraining exercise. The plants all operated on a site whose principle business was the manufacture of nuclear fuel, but also operated plants to recover uranium from process residues. A number of additional ancillary plants supported site operations. All three plants were involved in the manufacture of uranium hexafluoride (Hex). Hex had been produced on the site for many years, but market conditions brought on an early closure of the plants. This required the Post Operational Clean Out (POCO) of each of the plants. The plan was to leave the plants in a condition which would allow them to be safely brought back into operation if market conditions allowed this.

The overall approach to safety assurance throughout the change can best be described by breaking down it down into the following three subsections:

- Control of organisational change aspects;
- Control of post operational cleanout (POCO) and ongoing care and maintenance;
- Project oversight and direction

Keywords: Management of change, organisational change

Control of organisational change aspects

The site's management of change (MoC) process was used to assess the risk of the organisational change. This process is based upon a code of practice prepared by the nuclear industries' Safety Directors Forum[1]. An overarching MoC assessment was prepared, supported by a further 16 MoC assessments prepared at the departmental level where a reduction in the nuclear site baseline* was proposed. Fundamental to the control of the change process was the use of change plans. The purpose of these plans was to monitor the successful training and reskilling of staff being redeployed into new roles. This included the retention of knowledge and skills from staff leaving the organisation. These change plans described the way in which the retraining of redeployed staff would be carried out, and crucially the amount of time it would take to carry out the training to the point where particular employees would be allowed to leave the company. In this way the site's executive was able to gain confidence that the overall training challenge was indeed achievable within the allotted timeframe, and to monitor progress of the training programme against the allotted timeframe.

As noted above, the plants affected by this change supported in excess of 100 jobs. The company determined that overall the site needed to reduce its total manpower by about 100. This was achieved through a voluntary severance package offered to the entire workforce. Only a relatively small number of staff from the plants affected chose to leave the company. Whilst this resulted in a significant body of experience being retained should the plants ever re-open, it did require a significant redeployment and retraining programme which affected virtually every area of the site. This people transition part of the project looked at competency and knowledge transfer and was split into three work streams:

- *Redeployment:* This was developed around operational and engineering teams, where laid down procedures and documented work methods were available and used in the training process. This was by some margin the largest group of employees involved in the exercise.
- *Critical key roles:* This covered employees with professional skills and in some cases being recognised as site-wide experts in a particular skill.
- *Hex transition:* This covered the transition through various stages of the Hex business post operational clean out, care and maintenance, and restart.

Each of these is considered further below.

Redeployment

In order to carry out a training needs analysis for this group, the site reviewed its existing method of measuring a team skills capability. The revised method looked at three components:

- team strength;
- the operational capability index (OCI)† of the team; and
- flexibility‡ of skills within the team.

* *The organisation, roles and numbers of personnel required to deliver and maintain nuclear safety*

† *The Operational Capability Index is a measure of the breadth of training across a shift. For example, if every shift operator were to be proficient in every task the shift carried out, the OCI would be 100%*

‡ *The flexibility of the shift takes into account any restrictions shift members may have which, whilst they may be fully proficient in them, their restriction renders them unable to carry out the full range of tasks.*

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From the product of these three components, an average score was calculated referred to as the overall operational effectiveness (OOE). The OOE for each team affected by the redeployment exercise was calculated prior to any changes. This score was then set as a minimum target for the team once the redeployment and retraining exercise had been completed. Where necessary, a shift rebalancing was carried out to ensure that no single shift was overly burdened with new starters.

The task of retraining of this significant number of staff was eased significantly by making budgetary allowance for 'doubling up' of staff. This allowed redeployed staff to work alongside those whom they were replacing for several months prior to the existing member of the team leaving the company.

Critical key roles

As part of the management of change process, individuals identified as having a critical key role each had a change plan prepared for their role. This detailed the training and hand over requirements for the role. Additionally, the sites knowledge transfer process was used where it was considered that the nature and complexity of the role warranted it. The approach started by posing a set of specific questions to leavers about their role on site such as where the knowledge to enable them to do their work comes from. This was followed by further follow-up questions to help leavers identify the people or resources where knowledge resides, illustrated by detailed examples.

Hex transition

A review of the roles and skills required was carried out in conjunction with the scope and schedule of work. From this an OCI was developed for the team identified to carry out the work. Training was then carried out to fill any skill gaps.

A similar process was carried out for C&M activities.

Control of plant changes

Where possible, the control of POCO operations was through the use of existing operating instructions (OIs). For operations which fell outside OIs, a combination of risk assessment/ method statement and plant modification proposals (PMPs) was used to risk assess and control the POCO activities. The PMPs contained the following information:

- A description of the state of the area at start of POCO (hazards present, both radiological and chemotoxic, with quantities);
- The intended end state of the area in terms of remaining hazard;
- The process to achieve the end state with emphasis on 'non-standard' activities;
- The hazards and precautions associated with those activities;
- A summary (list) of the relevant aspects of the plant safety case appertaining to the particular POCO area.
- A list of the specific aspects of the safety case which may be suspended on completion of the area POCO.

Routine monitoring of the plants' safety performance was continued during the POCO period. This data showed no adverse results or trends during this period and no significant events were recorded.

POCO was managed through a master schedule which listed all those items of plant and equipment in each of the plants. Each item of plant was then electrically isolated. Isolation from other services was through air gapping and spading. Isolation of pressure vessels in this way removed the need for statutory testing and inspection. A pictorial standard was set for the level of cleanliness required for items of plant. For each item of plant, a 'POCO activity sign off sheet' (PASOS) was prepared. The purpose of this sheet was to state clearly the POCO end state, together with any comments on the 'as left condition'. A laminated copy of the each PASOSs has been left attached to the plant item in question. A master file of all the PASOSs is also kept in the project office. Through this process the 'as left condition' has been clearly captured, together with any important safety considerations needed for start up.

Where necessary, action was taken to ensure the continued safety of personnel who occasionally needed to enter the building. Additionally, steps were taken to protect plant from possible corrosion. For example, some vessels which retained a small 'heel' of hex were padded with ~ 150 mBar of nitrogen to prevent any potential for hex to react with moisture vapour. A number of O2 detectors were left in operation to warn operators of oxygen depletion should there be a leak of nitrogen. Also, in the F2 plant, pockets of electrolyte were likely to remain in fluorine cells. To prevent this reacting with water vapour, the building steam heating and extraction system was left on in the building. Fire detection and alarm systems were left in operation in each of the buildings.

Prior to transitioning to a care and maintenance regime a final walk down was carried out by the management safety committee chairman/chief engineer and the electrical senior authorised person. This resulted in a number of additional measures being taken, such as more visual indications of where service isolations have been made, and heaters in cabinets to prevent condensation on electrical switchgear.

The site shift manager (SSM) remains able to monitor the status of any remaining services and instrumentation from his office. Additionally, the SSM undertakes regular silent hours inspections.

Throughout POCO, only four minor injuries were recorded across the workforces of both plants. Examination of air sampling data for both plants clearly indicated lower levels of airborne contamination during POCO compared to those experienced during normal operations. No uranium in urine results greater than investigational levels were recorded in either plant during POCO.

Ongoing care and maintenance

The original philosophy adopted for the project was that POCO would lead to a care and maintenance regime in which a team of five staff would carry out the care and maintenance activities needed to ensure the plant remained in a state ready for restart. However, it soon became clear that the condition and standard of cleanliness being achieved for plant items, would leave the plant in a state which didn't require a continuously manned C&M operation. The C&M approach was thus to close the buildings for three-month periods, punctuated with a two-day period 'planned entry' when all the necessary inspections

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and checking of equipment was carried out, plus testing of safety equipment which remained operational such as fire alarms. A procedure has also been developed for 'unplanned entry' should this be required.

For each plant, an operating instruction manual was prepared for the ongoing care and maintenance.

Arrangements for project oversight and direction

Oversight and direction of Project Hermes was provided as follows.

- Overall direction was provided by the Springfields Fuels board of directors who monitored a set of metrics and took reports detailing progress on people issues, skills plans and POCO.
- An environment, health, safety and quality (EHS&Q) oversight committee was established which was a sub group of the EHS&Q forum. The function of this committee was to:
  - review all change management summaries including cumulative impact for site
  - address site specific concerns
  - identify good practice on plans across site
  - identify additional actions required for the change and request change plans to be resubmitted
  - document reviews, identify actions and track them.

In addition to the above:

- Two external readiness reviews were carried out in order for the site to gain confidence that the programme of work was sufficiently mature to proceed to the next stage. The first review, carried out before significant redeployment and training, focused on voluntary severance, redeployment and training. The second, scheduled at the mid-way point of the project, focused on POCO operations, skills and knowledge transfer, people redeployment and quality oversight. Each of these reviews was attended by independent members of the Nuclear Safety Committee.
- A written report on progress of the project was routinely presented to the site Nuclear Safety Committee. A number of suggestions were made and accepted from independent members.

The key metric used throughout the project to direct decisions on severance was progress on completion of change plans. Each area estimated the number of hours needed to train staff taking on new roles. The percentage of training hours completed informed decisions on severance. This proved to be a simple but effective way of monitoring departmental and overall site progress in implementing change plans.

The Office for Nuclear Regulation also requested the adoption of four additional metrics, namely:

1. Measure the number of times that the Working Time Directive is breached.
2. Record how often work is being deferred in workload rebalancing exercises, or how frequently 'routine' jobs are being deferred, including repeat deferrals, for all affected personnel.
3. Record if tasks are being omitted, i.e. not happening because of the workload of all affected personnel.
4. Record the frequency of contact from any affected personnel to the welfare manager or stress listeners.

1-3 were measured as part of ongoing business through performance centres. Contact of personnel with the welfare manager and stress listeners was through the welfare managers report presented at the joint management/employee representative health and safety committee. Neither of these showed any abnormal tendencies over the course of the project.

Future start up

The plant would have to be re-commissioned prior to restart. The complexity and extent of this is clearly related to the time for which the plant has been in a state of C&M.

Post project follow up

The site was keen to learn lessons from the execution of the project. To this end a post job review was carried out, attended by members of the site executive and senior employee representatives. The outcome of this review was generally positive, particularly so regarding communications and development of employees into vacated roles.

Conclusion

This case study has described the way in which a complex nuclear site successfully closed a number of plants, leaving them in a safe C&M state for potential future use. It also describes the means by which a significant redeployment exercise was successfully carried out following a large number of employees opting to take up an early severance package and leave the site. Fundamental to the success of the exercise was the regular monitoring of a number of project metrics by the site's executive. Site management worked closely with employee representatives throughout the project to quickly resolve any potential areas of difficulty.

References

1. *Nuclear Baseline and the Management of Organisational Change*

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