Safety, Human Factors, Culture and Lessons learnt from Decommissioning

Dr Azzam Younes, C.Eng. FIChemE, Principal Process Safety Consultant, ABB, Aberdeen

During Decommissioning sometimes it is difficult to maintain coherent safety culture, furthermore new risks might be introduced, such as an increased use of contractors. Communications with stakeholders become important including contractors, some of the tasks may be novel so no procedure exists. Significant organisational change, sharing lessons between different operators regarding decommissioning, and managing and maintaining the safety culture become important during Decommissioning.

This paper describes the Safety challenges surrounding the decommissioning of an offshore platform in the North Sea where ABB provided support. The paper highlights the Human Factors (HF), Cultural issues and the many lessons learnt during the management of a multi-national workforce during Decommissioning.

The issue of language and Culture between the work force and the understanding of what Hazards means was identified early in the removal program. As a consequence, the project took the opportunity to introduce cultural attachés to the workforce. The mind-set is important during decommissioning as the modules were being removed for reuse, for recycling, or for final disposal. As such, there was perception by some that the material was waste and that it did not matter what was broken into, damaged, or stolen. This had potential for serious issues to arise with waste material handling and consignment (e.g., exposure to asbestos materials or LSA)

Keywords: Safety, Human Factors (HF), Culture, Decommissioning

Introduction

Decommissioning is the process which the operator of an offshore oil or gas installation goes through in order to plan, gain approval for and implement the removal, disposal or re-use of an installation when it is no longer needed for its current purpose.

Decommissioning occurs when oil or gas production from a field is exhausted or when an installation reaches the end of its useful life.

The owner/operator is required to prepare a Decommissioning Programme which identifies the decommissioning options, evaluates the technical feasibility, assesses the environmental and societal impacts, and minimises the risks to human health and safety. The operator makes a recommendation to the government but the government makes the final decision.

The principal method of small platform removal and that proposed for larger platforms would be to lift the topsides onto a HLV and then lift all or part of the jacket also using a HLV (Figure 4). Such operations are weather-dependant, implying a seasonal requirement competing with installation activity, which could have cost implications. In addition, the world HLV fleet is small, with some nearing the end of their working lives. (Figure 5, Topside hook down & removal)

In accordance with OSPAR Decision 98/3, the comparative assessment of decommissioning options should take account of, but not necessarily be restricted to:

- Technical and engineering aspects of the option, including re-use and recycling and the impacts associated with cleaning, or removing chemicals from, the installation while it is offshore.
- The timing of the decommissioning.
- Safety considerations associated with removal and disposal, taking into account methods for assessing health and safety at work.
- Impacts on the marine environment, including exposure of biota to contaminants associated with the installation, other biological impacts arising from physical effects, conflicts with the conservation of species, with the protection of their habitats, or with marine culture, and interference with other legitimate uses of the sea.
- Impacts on other environmental compartments, including emissions to the atmosphere, leaching to groundwater, discharges to surface fresh water and effects on the soil.
- Consumption of natural resources and energy associated with re-use or recycling.
- Other consequences to the physical environment which may be expected to result from the option.
- Impacts on amenities, the activities of communities and on future uses of the environment.

Hazard Management

The company operating the facilities developed a detailed strategy for the identification and management of hazards which was jointly agreed by the operator and decommissioning management contractor. This paper described the means whereby potential hazards were to be identified, assessed, tracked and closed out during the planning stages of the project, and the means by which hazards were to be managed during the execution of the project.

Hazard Identification and Risk Assessment

Hazard identification is the first stage of the hazard management process (Figure 1). The intention of hazard identification is to ensure the identification of all potential hazards associated with the project. This took place as a staged approach starting with the high level identification of Major Accident Hazards, then through the detailed activity based hazard identification, the risk assessments of specific tasks to support the activity permit development, through to the site based review of the risks and the tool box talks to communicate these risks.

All stages of the operation went through a detailed HAZID process:

- Hook down and preparations for lifting on the platform
- Vessel preparations, mobilisation, sailing to field, entering 500 meter zone and anchoring out
- Cargo barge mooring, module or section lift off, transfer of modules to cargo barge or HLV, transfer of modules or section from HLV to cargo barge, sea fastening, unmooring of cargo barge and sail-away
- Cargo barge transport to recycling / disposal yard, take over by harbour tugs, mooring at dismantlement and disposal yard, removal of sea fastening, installation of trailers, load-in and set down of modules
- Demolition, recycling and disposal of modules
- The interfaces between the above activities

Waste types found on platform

- Residual Hydrocarbons – emulsions - chemicals
- Mercury – fluorescent lamps
- LSA – NORM
- Asbestos – passive fire protection
- Corrosion inhibitor
- Coolant containing PCB - Paints
- Hydraulic – diesel – lube – transformer oils

HAZID

All hazards identified through the process were recorded in a hazard register for tracking and close-out at the planning stages. The hazard register was a living document, with hazards assigned a management status and to ensure that all necessary actions were completed before approved close-out.

The following were key issues and hazardous activities identified through the project hazard identification process:

- Miscommunication
- Interface issues
- Working at height
- Heavy lifts
- Scaffolding
- Overside working
- Marine movements
- Breaking containment
- Use of cutting gasses
- Caisson removal
- Simultaneous activities
- Security of walking / working surfaces
- Changing configuration of the platform

Human Factors

Decommissioning carries specific issues or risks, hence a detailed HF methodology (Figure 2) was developed for the delivery of safe and efficient methods in the decommissioning of hazardous systems. Many systems are designed without a good understanding of how they will be decommissioned. Even if they were available for certain systems, when decommissioning is necessary, it often occurs as a specific project. It was necessary to consider such issues as remote

handling, exposure [time] to hazardous substances, operator time pressure and stress. The following are some of the HFI procedures which were carried out:-

- Task Analysis
- Hazard Identification
- Risk Analysis
- Operations Design and Optimisation

The human factors are different sets of activities in decommissioning; but nevertheless they are still in the project and they should still link human factors activities to the lifecycle of the project. In that context some risks are removed (e.g. material leaves site) and new risks introduced.

Some of the risks which have been introduced during the decommissioning:-

i. Communications with the regulator, contractors, other sites, etc.
ii. Increased use of contractors
iii. Demolition and construction activities
iv. Evolving tasks, may be novel; hence it has no procedure
v. Significant organisational change
vi. Managing and maintaining the safety culture

The HAZID process utilised a standard set of hazard identification guidewords, however, to recognise the importance of Human Factors within this project, a set of HF guidewords were added to the process. A general appreciation of the guidewords was added to ensure the review team were aware of the background. The HF guidewords were aligned with the Human Factor contributors to major accident events (UK Health and Safety Executive Human Factors Preventing Major Accidents (Figure 3)).

The Human Factors guidewords included:

- Safety Critical Communications
- Managing Human Failure
- Supervision
- Interfaces
- Behavioural safety
- Training and Competency
- Fatigue (from shift work and overtime)
- Staffing levels and workload
- Alarm handling

In summary the human factors were considered and identified during the decommissioning process, further more they were also considered in terms of the implications on control independence and effectiveness. This demonstrated how controls reflect the company Intentions and Expectations of human behaviour and performance.

Project HSE goals, policies and objectives

HSE goals

Throughout all stages of the Decommissioning Project; the goal and aspiration was to achieve zero accidents, with no harm to people and no damage to the environment.

The project has developed the following additional goals:

i. No spills or discharges of oil or chemicals to land or sea
ii. Maximise efficiency of energy and resource use
iii. Maximise recycling of materials through application of the waste management hierarchy
iv. Restore the site to as close as possible to its original state or a condition suitable for its next intended use
v. No nuisance during decommissioning works (including visual impact, noise, odour, dust, interference with other sea users and onshore local communities)
vi. Balance societal, safety, economic, environmental and technical considerations in the decommissioning process.

Key policies

The decommissioning project implements the HSE management system to ensure compliance with the company HSE policy and legislative objectives. Environmental aspects were managed through ISO14001 which was maintained throughout decommissioning operations on project site, until both the topsides and jacket were delivered onshore. An ISO14001 bridging document was developed by the contractors working offshore. The waste hierarchy (reduce, reuse, recycle, dispose) and best practicable environmental option was applied.

A plan was written for the Heavy lift operations and onward disposal to onshore disposal sites including the interfacing with and subsequent transfer to the Contractors Management System. Certain elements of the company SMS however may be mandatory for the duration of the project; these elements were identified during the design competition. The existing company SMS has been compiled based on normal production operations and as such some elements were found not be appropriate to decommissioning activities. A full gap analysis of the system was undertaken during the design stage to identify applicable elements and potential gaps within the system. The company / contractor SMS strategy and how the relationships will work was subject to review during the design stage but contractors were required to manage their activities according to the project HSE Philosophy and apply HSE standards to all activities regarding Safety. Interfaces were identified and effectively managed through interface documents, service agreements or contract processes.

Key project objectives

The overall project objective is to apply whatever the best solution dictates, taking into consideration, safety, cost, technology, environmental and social impact.

In terms of specific health, safety and environmental objectives, the project aims to;

i. Ensure that Formal Safety Assessment (FSA) is an integral part of the project implementation process where required.

ii. Encourage selection of inherently safe options and BPEO

iii. Ensure that the HSE risks associated with project implementation are demonstrably reduced to As Low As Reasonably Practicable (ALARP) and minimise environmental impacts. In addition to demonstration of ALARP the risks must be demonstrated as acceptable and within the company and regulatory authority limits.

iv. Meet legal requirements and deliver accepted Combined Operations, Abandonment or other safety case where required

v. Comply with environmental legislation and consents

vi. Comply with the company policy and project-specific requirements

vii. Take all reasonably practicable steps to minimise discharge or escape of oil as a result of these operations

viii. Ensure that our employees, contractors and others are well informed, well trained, competent, engaged and committed to HSE excellence

ix. Regularly provide assurance that the HSE processes in place are working effectively

HSE targets

The project has identified the following performance targets:

HSE inputs

i. 100% of personnel engaged in offshore de-construction will participate in an integrated health, safety and environment induction

ii. Minimum two Advanced Safety Audits (ASA) and permit audits per day during offshore de-construction

iii. Full-time Company OIM and Safety Coach offshore for duration of offshore deconstruction activities topsides removal

iv. A minimum of monthly offshore visits/audits by the company Management team. Contractor's management visit and audit schedule will be determined within the contractor's specific HSE plan.

v. Minimum 6 monthly disposal yard audits by the company management team or 3rd party safety/environmental auditors.

HSE outputs

i. Zero OSHA-recordable injuries to the company or contractor personnel

ii. Zero high potential incidents (HIPOs)

iii. Zero spills of oil or chemicals to land or sea (zero PON1s)

iv. Minimum of 97% by weight of topsides material will be recycled

v. Minimum of 97% of the recovered platform jacket will be reused or recycled

vi. HSE reviews will be carried out according to the company Assurance Plan and 85% of actions closed out within agreed timescale

The Contractor defined and managed the HSE performance targets equivalent to those of the project. An audit was carried out on the contractors to establish the existence of an effective and compatible HSE management system; this was particularly relevant for the onshore disposal yards. The project carried out periodic checks to ensure its objectives are being met in respect of the contractor's and overall project HSE performance.

Conclusions and Lessons learnt

This paper has described he key finding during the decommissioning process for an offshore platform. The organisation and the technical challenges with work of this scale. The lessons learnt from this project can be implement in future decommissioning projects to help lives and enhance the HSE performance.

HSE Engagement

A programme of HSE engagement sessions was developed. Members of the project team went through a range of regulatory engagements with all stakeholders throughout the project lifecycle to ensure success.

Liability

Perpetual residual liability remains with the owner of the original infrastructure at the time of decommissioning according to OSPAR, however it remains unclear as to where the liability lies when it is recommissioned for another purpose.

Long Term Considerations

By the time infrastructure is being removed from the North Sea, the introduction of renewable installations may have changed the way the North Sea operates and therefore will impact on how we address decommissioning.

Technical Lessons Learned

Utilities

Using smaller fit-for-purpose generators rather the main platform GT(s)

Use/ modify existing systems or install new fit-for-purpose

Cranes

Mothball lifting capability for future use during decommissioning activities

Accommodation

Preservation or provision of accommodation for future decommissioning use

Preservation or provision of emergency shelter for unplanned overnight stays

Dropped Objects

On return to platforms that were NUI, removals contractor identified multiple potential Dropped Object items. Minimise NUI period to negate deterioration effects, or consider early removal of potential future dropped objects, e.g. signage, lighting

Helideck

Helideck netting rotted during NUI period, paint fading and obscuration from bird guano; ensure helideck maintenance is up-to-date and condition is monitored during NUI period, consider bird scaring system.

Firewater (CAP437) requirements, existing system, modified system or portable solution; manual or remote activation.

Permit to Work

Agree permit systems early (Operator/ Contractor and Paper/ Electronic) and keep it up to date. May need to re-write permit system rules for when site is essentially de-construction only, e.g. single permit for multiple operations.

How clean is clean?

Agree specification for topsides pipework cleanliness and procedures for ongoing monitoring and method for prevention of fugitive vapour/ liquid accumulation over time.

Reverse installation

Clear guidance on method of separation of modules to ensure maximised gaps for lifting. Consider supports for tray and pipework penetrations.

Hand tools

Previous decommissioning projects have let stores run down and let departing technicians take their tool-kits such that during NUI visits there was nothing available on the platform, everything had to be identified before the trip and brought out on day-flight or vessel.

Workforce Lessons Learned

Image

Skilled people perceive decommissioning as the end of the road for their careers.

Culture

The issue of language and Culture between the work force and the understanding what Hazards means was identified early in the removal program. As a consequence, the project took the opportunity to introduce cultural attachés to the workforce.

Communications/ Language

Improved communications between all those involved in planning this work at all stages, both onshore and offshore, could have identified any latent hazard

The multinational/-cultural/-lingual workforce routinely attended toolbox talks; but, through audit and inspection, it was identified that, at times, a full understanding of the potential hazards was not gained. On investigation, it was identified that the term “hazard” was not fully recognized and understood by some members of the workforce.

Mind Set

The modules were being removed for reuse, for recycling, or for final disposal. As such, there was perception on the part of a few that the material was all just waste and that it did not matter what was broken into, damaged, or stolen. This had potential for serious issues to arise with waste material handling and consignment (e.g., exposure to asbestos materials or LSA)

The lessons learned related to this include good planning and removal of any loose items that could be considered of value, as well as clear and ongoing communication to the workforce about the issues.

Interface

A program of project inductions and HSE awareness sessions was developed. Members of this new team went through a range of team building activities to help them understand each other and set them up for success.

References

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3. Oil and Gas UK Guidelines on Safety Management Systems Interfacing

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Glossary

ALARP	As low As Reasonably Practicable
ASA	Advanced Safety Audit
BPEO	Best Practicable Environmental Option
CAP437	Standards for offshore helicopter landing areas
CoP	Cessation of Production
FSA	Formal Safety Assessment
GT	Gas Turbine
HAZID	Hazard Identification
HF	Human Factors
HFI	Human Factors Integration

HIPO	High Incident Potential
HSE	Health Safety and Environment
HVL	Heavy Lift Vessel
LSA	Law Specific Activity
NORM	Naturally Occurring Radioactive Materials
NUI	Normally Unattended Installation
OIM	Offshore Installation Manager
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
OSHA	Occupational Safety and Health Administration
P&A	Plug and Abandonment
PCB	Polychlorinated Biphenyl
PON1	Petroleum Operations Notices
PIF	Performance Indicators Factors
SMS	Safety Management System

Fig (1) Hazard Management Process

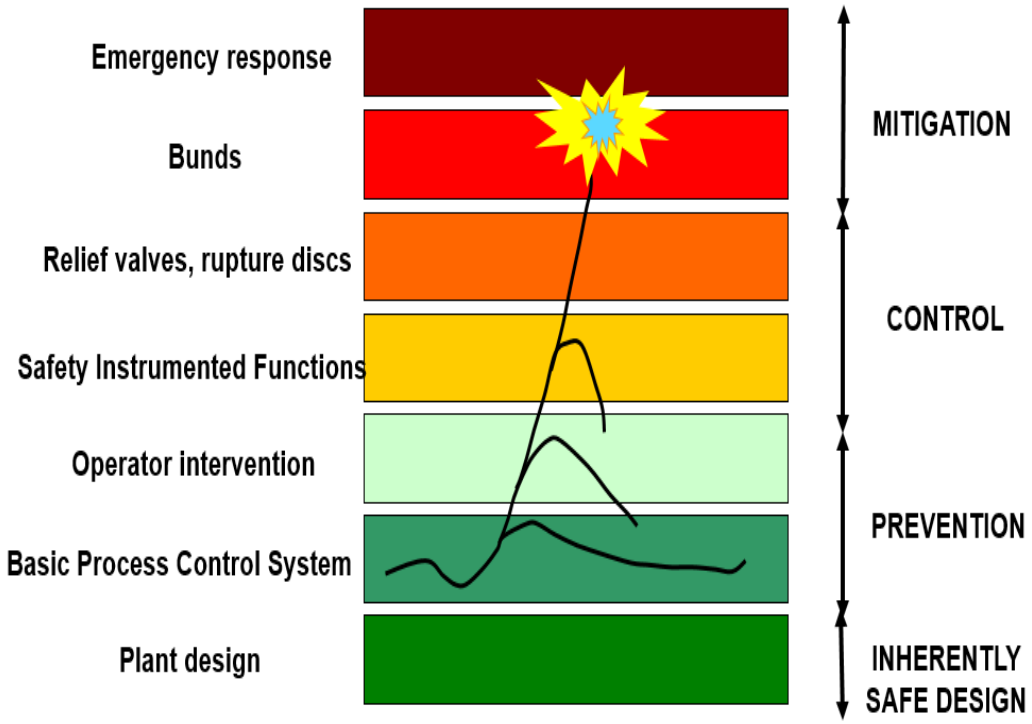

Fig (2) Human Factors Methodology

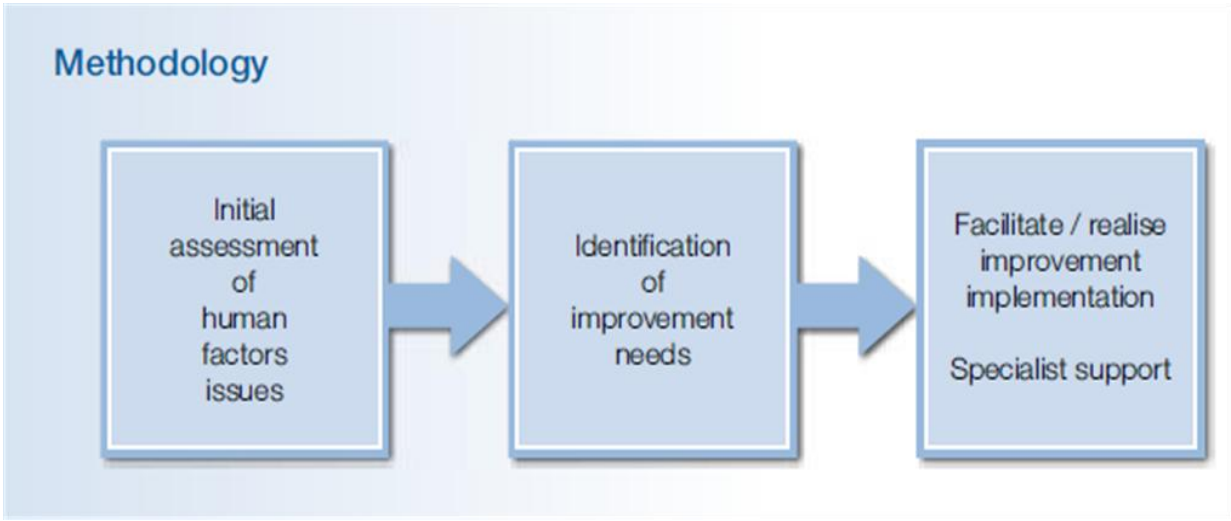

Fig (3) HSE Human Factors Roadmap

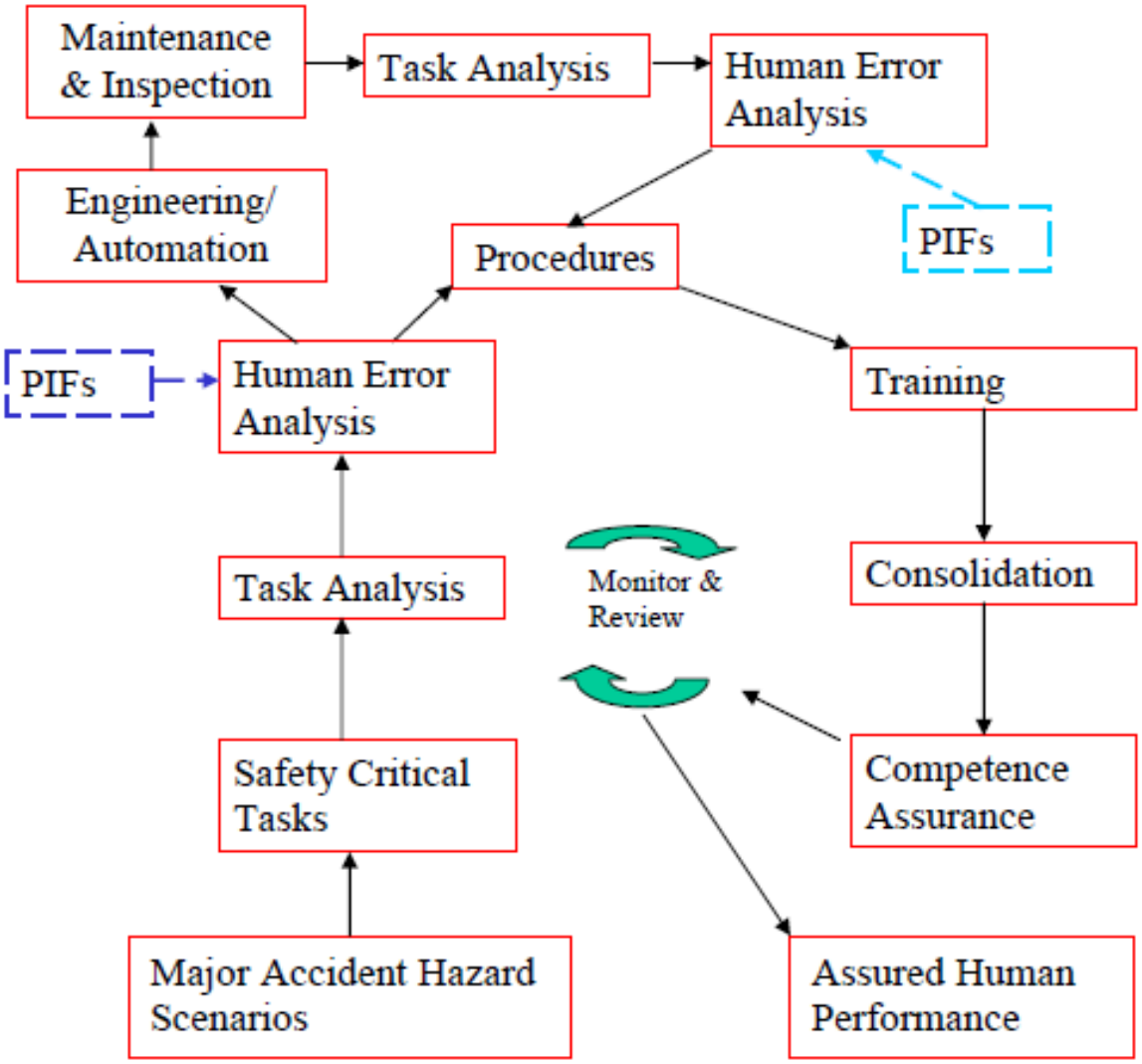

Fig (4) Bridge from the VHL to the platform