Evaluation of the role of human factors in offshore platforms and systems in uk r...

Business, Industries

Major accidents and incidents in various offshore platforms and systems around the world have occurred leading to lose of lives and property. Investigations conducted have come up with recommendations but less has been given in terms of human factors. Accidents such as Piper Alpha disaster lead to a loss of 167 workers and millions of others.

The recommendations tabled by Lord Cullen cited the fact that Occidental used inadequate maintenance and safety procedures. The more than 100 recommendations tabled detailed how safety of workers were compromised after the company massive scaled back spending as a result of a plunge in the prices of oil prices to as low as $8.

In the design of the structure, the staff quarters were kept away from the most dangerous production levels of the platforms. The installation of the gas compartment next to the central room diluted the safety precautions. Occidental made more dangerous when it advanced on a construction, maintenance and upgrade procedures while keeping the oil and gas production platforms.

The cause of the accident was attributed to lack communication between staff. A shift that did not know that they were not supposed to use a piece of pipe work that had no safety valve and had been sealed with a temporary cover lead to a gas leakage. The leaked gas ignited and could not be stopped by the firewalls.

The fire completely destroyed the platform and took more than three weeks to contain it. Property worth billions of dollars was lost apart from the human loss. Piper Alpha accident remains on e of the largest man-made catastrophe in history (Cox, 2000).

The accident tends to revolve around the human involvement and human factors. This research revolves around the maturity of offshore companies and their capabilities in managing the human contribution to safety in the development and procurement and development of offshore platforms and systems.

AIMS

It is common knowledge that human factors elements have been sidelined in the design of process safety models. In fact, human factor element is missing in the process safety model comprising of 14 elements. Advancing along this line, it is important to realize that good safety management systems incorporate human actions and behavior in ensuring health and safety. Safety management systems can achieve so much more when the inherent design of equipments and human behavior is factored in its development. Indeed behavior design and human behavior are inter-related especially in the offshore industry. Good practice principles should be incorporated and controlled through design processes. Training, procedures and other organizational controls come second where control by design is infeasible. This paper seeks to develop a means of establishing whether equipment used in the offshore industry can be considered safe because of the way they were designed and human factors put in place to control its use. This is in recognition that accidents such as Piper Alpha was as a result of behavioral and design failures.

The study desires to bring out integration processes that improve identification and management of human-related elements playing out in health and safety during the design and development of offshore platforms and systems. Specifically, the study aims to provide a clear means of accessing the status of offshore organizations best practices in applying human factors elements in the development of safe platforms and systems for management.

OBJECTIVES

The objective of the study is to improve system performance and reliance through optimization of personnel performance, health, and safety through effective integration of human factors into engineering principles of offshore projects. This is achieved through:

- Provision of management and line responsibility with enough resources for human factors engineering implementation
- Integrating HFE activities and tasks into the project schedule for major phases
- Creating awareness of HFE at all levels of the project including design, construction contractors and vendors
- Demonstrating economic and health, safety, and environmental benefits from integrating HSE

SCOPE

The study probes the capability and maturity of offshore companies and establishments in developing and empowering human factors in safety mechanisms. It is intended for human factor inspectors as well as other entities concerned with the safety of offshore establishments. The findings are of great value to offshore industries supply chain as each characteristic is linked to a key element in the successful health and safety management processes. Under the HSG48 - Reducing Error and Influencing Behavior each human factor element is aligned with ISO capability maturity models, Design Safety Maturity Model and Safety Culture Maturity Model.

The study is also useful to contractors, duty holders, suppliers, and designers as a means of understanding the human factors that are under inspection by the inspectors. The study will be of great help in the development of frameworks to be integrated with the HF within organizations. It is expected to be used in the following ways (Elizabeth, 1996);

- Improvement of engineering and management procedures
- Planning tool for HF assessment
- Internal system assessment
- Identification and reduction of human-related error
- Overall project monitoring
- Contractor management and procurement
- Day to day operations of the systems including accident analysis and near-accident scenarios
- Design and assessment of safety principles and risk management

INTRODUCTION

The study of human factors is a scientific principle that deals with the systematic application of information about human characteristics and behavior to improve performance of man-made machines and enhance safety. Majority of studies in human error analysis have originated from expert judgment techniques such as Technique for Human Error Rate Prediction. The need for expert judgment techniques arise because human factors have been cited as the leading cause of accidents and the associated consequences of such accidents such as Chenobyl. Similarly, the Piper Alpha and Ocean Ranger disasters have generated greater awareness of the effects and ramifications of human error in offshore oil and gas processing. Human’s plays a major role in accident causation as well as emergency response and safety procedures.

Offshore platforms and systems have significant potential for dire consequences and present a challenging scenario for human factors. There has been neglect in the quantification of human reliabilities and capabilities, thus, presenting a new front for research and development of new models that could link human factors and quantitative risk assessment. A pertinent issue is the concept of human factors and how they are defined and applied to the offshore risk analysis scenarios. The results have been a lack of knowledge on how human error identification can be applied to preempt high risk scenarios.

A better understanding of human factors and its consequences to safety can be achieved through application of models. To accomplish this, human factors must be isolated from the emotional domains of blame and categorized in a systems context. Human factors play a major role in combating accidents and achieving overall safety in offshore productions. The leading elements of human factors can be defined and managed. Such efforts form an essential component in an overall scheme of process safety and management.

Human error is the leading cause of accidents in many industries. Statistics attribute 85% of accidents and losses to human error. The sources are varied and subject to scrutiny, but provide a reasonable oversight of the role of humans in ensuring safety and accident reduction either through direct or indirect means.

The UK Health and Safety Executive (HSE) defines human factors as environmental, job and organizational factors, system design, human characteristics and task attributes that influence behavioral activities leading to safety and health of the concerned.

In the context of this study, human factors related to the contribution of the humans to the systems capability and the short terms and long terms effects including fatigue, health and well-being. It also relate to the role played by humans in effective system management including recruitment, training and support.

In terms of safety in critical industries, human factors relate to the people-related factors that are thought to cause problems in operations. With this view, human error can be avoided by combining good information, clear procedures, memory aids, training, distraction avoidance, clear objectives and a good working environment (Mearns, 1995).

DATA COLLECTION

This study uses the Human Factor Assessment Model design to satisfy a number of requirements. The ten principle requirements the model has adopted include business relevance, accessibility, reasonability and practicality, understandability, ease of application, informative and diagnostic, reliability, focus, traceability and good practice.

DATA ANALYSIS

The section presents the Human Factor Assessment model basing on the elements of good practice and reasonable and practical objectives the project is supposed to cover.

A general notion in the offshore industry is the fact that many industries probably already complies with the human factor “ good practice” though it does not exclusively refer to it as human factors(Flin, 2006).

A gap analysis reported a series of gaps in the companies involved in the design of offshore industry projects and how the reported gaps compares to what is considered good practice. There are many models of human factors but none has been tailor made for the offshore industry in the UK. Examples are the US Marine Engineering standards for human factors. The International Standards for control rooms and the design of software intensive systems are relevant in this field, as they incorporate internationally agreed model of best practices used in software-intensive systems. A number of documents published in HSE are also important for consideration.

The aim of the HFAM assessment is to derive the levels of human factors capabilities that describe the organization or project. This includes elements of good practice, achievements toward best practices and best practice.

The elements are defined as follows

INTERPRETATION

In order to assess and assign the HFAM scores to capability levels, empirical process are applied. A set of forty four possible combinations was designed and experienced human factors professionals in the offshore industry sought to make judgments on the level of capability associated with any of the combination (Vincent, 2001).

In rating the scores, best practices was considered if all the five elements satisfy the assessor. If four out of five combinations were excellent while the other did not achieve total scores, the combination produced a score of less than 100% (O'dea, 2001).

Scores for human factors are interested easily. The higher the score (almost 100%) the better the assessment and the efficient the model in explaining the human factors. Then study is not motivated by producing scores but the scores act as a mechanism for organizations to benchmark themselves against good and best practices.

The challenge faced in interpreting the results in this version lies in the disparities of elements among different organizations. Organizations may interpret any of the 21 elements differently depending on the prevailing conditions at that particular time. Organizations in the offshore industry will inevitably be better in others while poor in pothers.

Thus, the table presented above presents a basis for judging human factors by interpreting HFAM scores considered to be a reasonable basis for Human Factors capability reflected by diverse combinations.

LIMITATIONS

A general misconception for those who took part in human factors validation is the fact that the offshore industry is already compliant with the best practices in Human Factors though it doesn't necessarily refer to them as

Human factors. This calls for a gap analysis study among the industry players to determine activities in engineering projects that take into account human contribution to safety, health and environmental concerns. This is applicable to the development of new or modified equipments or operations. The approach taken in this study involves pragmatic realization of the human factors elements contrary to whether the label Human Factors was considered.

An analysis of major companies in UK offshore business reveals some interesting statistics. Almost all of the companies have adopted Hazard Identification and Hazard Operability Studies processes. The processes are applied early in the design phases to address pertinent problems from the start of the design process. An example of such application is the design and development of plant Piping and Instrumentation Diagrams.

Also the task risk assessment procedures are applicable to all companies. The process is applicable to existing operations and tasks in compliance with Management of Health and Safety at Work guidelines.

In relation to fatigue and working time, it emerged that HSEs Safety Notice 4/96 is applicable to operational risk assessment to account for nature of the demands, work activity, sleep duration, and the prevailing working environments. Fatigue is considered a reasoble occurrence that requires reasonable steps to mitigate its negative effects.

Likewise test and evaluation processes are key elements that are essential in design processes. Through computer simulations of human performance, workload and human error, usability reviews, design walkthroughs user trials, usability and operability are routinely and formally demonstrated in the industry.

Finally all reported incidents and accidents are required to be investigated, documented band recommendation s used effectively to improve awareness, training and procedures. The results of safety reviews, experiences and lesson learned form a viable source of information for combating HSE issues which operators routinely goes through.

CONCLUSION

The HFAM technique has been applied sufficiently to determine the human factors in the offshore industry. It is evident that the UK industry exhibit little differences in terms of ratings as applied to human factors. Analysis reveals that there are little disparities between the HFAM information and the notion that the industry already has reasonable and practical human issues in design. There are some elements of good practice in some aspects of the industry including application of human factors in the design and assessment of procedures and hazards. However, there are areas where evidence of good practice especially lack of validation of human factors in design lacks. Recurrence of examples of poor design is cited as the leading cause of accident in the industry.

Finally, the study has suggested that the industry is comfortable with Human Factors as an engineering concept with varied understandings and application.

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