

ORIGINAL ARTICLE

OFFSHORE SAFETY AWARENESS TRAINING SYSTEM

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ABSTRACT

Safety is vital in any industry, including the offshore sector, which is classified as a major hazard industry. Health, Safety and the Environment (HSE) identified that the probability of accidents is high while working on the offshore sectors where it will exposed workers to many hazardous work activities. The appropriate measures to prevent accident in this sectors must be laid out clearly. This paper is to identify the effectiveness of safety awareness campaign and the continuity of the awareness among the workers to prevent injuries at offshore. To achieve this, we have identified the level of awareness and propose a guideline on areas of improvement. Prior of embarking to offshore, staff were exposed to safety awareness program for four weeks. After the program, we started with the pretest to all staff. They were posted offshore for 6 weeks. Within the period, the performance awareness of each staff is monitored through observation and interview. During the final week, the posttest questionnaire were administered to all staff. Two instruments were used for the quantitative data collection, which are Unsafe Act Unsafe Condition (UAUC) card; and Behavior Observation Tool (BOT) card. Questionnaire data were analyzed quantitatively. Paired-sample t-test was used for analyzing pre and post result. The results show that the mean was increased. Recent studies on the safety briefing highlighted several significant changes in terms of employee understanding toward safety. Safety awareness training has been introduced in the new safety briefing prior to offshore mobilization.

Keywords: Offshore Sector, HSE, Hazards, Unsafe Act/Unsafe Condition, Behaviour Observation

INTRODUCTION

In recent years, there is realization that the reliability of safe work systems in achieving safe operation is desirable to every industry including companies from the oil and gas industry. A high profile disaster over the past two decades has indicated the most notably the Piper Alpha disaster in 1988 in which 167 personnel lost their lives, oil and gas industry companies are making every effort to ensure that their accident rates are kept as low as possible.

Based on the incident in the industrial, there is a causal chain of organizational conditions and human errors indicating that human-factor causes can be attributed to 70-80% of accidents in high-hazard industries. One critical factor in

preventing accidents is the ability of workers to maintain an adequate understanding of their worksite situation. This means having a high level of awareness of task and environmental conditions, and judging how these may change in the near future to predict how the situation will develop. Possession and maintenance of good quality appears to be of particular importance in the offshore oil and gas industry, where the work is hazardous, time pressured, and complex. On board an offshore drilling rig or production platform, the crews are involved in one of the most dangerous activities. A challenging work environment and being away from family is the biggest pressure and challenge to the oil and gas workers. The same daily routine work makes the employee inadvertently work the wrong way in which can be dangerous to his colleague and also

can contribute to accidents. The oil and gas environment can change suddenly and for a crew with the incorrect decision can cost millions of dollars (in both equipment damage and/or production loss), but safety costs can be far more severe, with the capacity to result in loss of human life.

Safety awareness campaign is one of the best methods and initiative on how to educate the workers knowledge toward safe working culture at offshore. Low understanding of hazard towards workers is a key factor that leads to incident at offshore even though safety awareness campaigns have conducted before mobilization. It is not only an awareness campaign but at the same time the main objective is to transfer the knowledge as knowledge sharing to the workers to practice during performing their task. Apart from the campaign, training materials and deep knowledge are also important to ensure that all workers understand the dangers of their job. Ensure that every worker understands the hazards of their work will reduce the risk of harm that leads to injury and death. As we all know, workers that working in oil and gas industry is highly equipped with high education and experience employees but lack of knowledge of the issues pretending to hazard associated with the work. They only know how to carry out their work without knowing the potential hazards associated to their work that can cause injury.

There are two primary causes of accidents, namely unsafe acts and unsafe conditions. An unsafe act is including disabling of safety devices and being under the influence on the job. Based on the previous data from International Labor Organization (ILO), 88% of all accidents are caused by unsafe acts worldwide while 12% caused by unsafe conditions. Unsafe conditions are defective tools or equipment, lack of machine guards and poor lighting at workplace. It can be eliminate by using engineering controls to control the hazards.

Many accidents occur through involvement of people within their work. As technology advanced, the technical systems are more reliable now, the focus need to be turned to human contribution cause of accident. Research studies (Health and Safety Executive, United Kingdom, 1999) show that 80% of accidents may be attributed at least in part to the actions or omission of people. Table 1 showed how the failures of people at many levels within an organization can contribute to a major disaster.

Human factor can be described as the interaction of individual with others people, facilities and management system. Nature of work and working environment can influence the interaction. Difference in safety culture on risk taking can influence a good system if work. Traditionally, Health, Safety, Security and Environment(HSSE) management system developments focus on the facilities and the management system itself and pay less attention to human error.



Figure 1-Incident Causal Factors in Offshore

Human factor contribute to at risk which will eventually lead to incident and accident. To address the root cause for incidents contributed by human error is a difficult task (Nick,F.P 1991). A management focus on how to improve employees working environment, behavior and attitude can have a significant impact on the safety result in construction operation and subsequent on the operational cost. Figure 1 shows the accident statistic study of the world largest oil and gas exploration company ExxonMobil, 55% incident causal factor are related to human error (Tom 2002).

METHODOLOGY

It was based on quantitative data analysis to determine the effectiveness of safety awareness campaign in this research. Primary data collected from the questionnaire is carried out before the training to know the effectiveness of a campaign. This process has been conducted during pre-mobilization safety briefing. This method will show an employee's level of understanding toward the training. Secondary data collection will be based from observations to be carried out in the workplace.

These observations will be performed by someone who has been given responsibility for making observations of the employee. With these observations, we will know the level of understanding of a worker after training awareness in the workplace by practicing what they have learned before.

Research design for this project will be based on current offshore project and using the actual data to determine the result of the research. The objective of this research is to identify the knowledge and level of awareness toward workers. It will be divided into two parts known as primary and secondary data. Primary data will be based on questionnaire test. Details design of operational framework showed on Figure 2 as below.

In order to create the awareness on safety training, pre-test and post-test will be conducted. Pre-test will be distributed prior to start the safety awareness training and post-test will be conducted at offshore workplace. The purpose of pre-test is to gauge the actual level of awareness among workers before the training started. Once finished the pre-test, a proper training will be provided to workers to ensure that workers are given exposure and also sufficient knowledge about the safety. This training is to educate workers to work safely. Post-test will be carried out in the next stage and will be conducted at offshore workplace. The purpose of this exercise carried out at the workplace is to measure the

effectiveness of safety training that has been given before. Both data from pre-test and post-test later will be analyzed for its effectiveness.

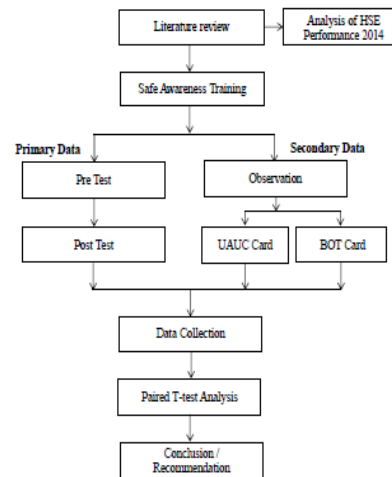


Figure 2-Operational Framework

Secondary data will be referred to unsafe act/unsafe condition card and behavior observation card. This data will be implemented in full scale at offshore workplace. According to the past researcher, workplace observation will be contributed to the ways of behavior toward working. The implementation for this secondary data is to determine whether the knowledge during the training been implemented at workplace.

Finally, all the data received will be analyze using SPSS paired T-test (comparison between group) to identify its effectiveness. Based on the results, a new guideline will be proposed to the management on the areas that need improvement.

Primary data is obtained from the Pre-test questionnaire paper distributed to workers during pre-mobilization safety briefing / safety awareness training prior to offshore mobilization. The main objective is to explore the level of understanding of safety awareness among workers prior to the training. Post-test questionnaire paper will be distributed among the workers prior to demobilization. Duration between dis-

tribution the Pre-test and Post-test papers is 30 days and the collection data received from the Pre-test and Post-test paper later will be analyze to identify the comparison of the data during analysis and any areas of improvement will be discussed and recommendation will be proposed for continual improvement.

Another quantitative research, there are 20 elements for unsafe acts and 20 elements for unsafe conditions inside the card. The UAUC card is distributed to the workers at workplace to fill inside the card. Anyone including workers is welcomes to fill in the card and submit to the representative safety officer at workplace. Once received the card, representative safety officer are responsible to rectify the issues. Findings will be recorded once action taken.

Behavioral observation also will be conducted at workplace by using BOT card. There are 12 elements inside the card to be filled in and each element is related to behavior issues. Representative safety officer at workplace is the responsible personnel to conduct the observation. This is totally difference from UAUC card. Specific training regarding the BOT has been given to the representative safety officer to conduct the observation at workplace. Findings from the cards will be recorded and continuous monitoring is required to monitor the issues.

RESULTS

The primary data was collected through pre-test and post-test. Pre-test and post-test papers are divided into two stages; the first stage was conducted prior offshore mobilization during safety briefing and the second stage was during offshore workplace. As for the secondary data, it was obtained via the observation collected from UAUC and BOT. Set of questionnaire consisting of 17 questions were distributed to the 80 workers during this project. Workers were give 30 minutes to answer all the questions in the questionnaire and return the questionnaire after completion. All questionnaires were returned timely and there was no issue upon collection.

In the effort to produce a research which is trustworthy, both data from actual offshore project will be used during this research, which are primary data as well as secondary data. Quantitative research consists of primary data (questionnaire test) and secondary data (observation UAUC/BOT card). The target population participating for this study will be 80 workers including following personnel on the construction project such as below:

- Construction Superintendents - (1 personnel)
- Project Engineer/Electrical Engineer/Construction Engineer - (3 personnel)
- Planning Engineer - (2 personnel)
- General Supervisor - (3 personnel)
- Foreman - (5 personnel)
- Scaffolder - (12 personnel)
- Welder / Fitters - (10 personnel)
- Fire Watcher - (16 personnel)
- Riggers - (28 personnel)

The primary data collected from Pre-test and Post-test will be analyzed with the usage of Statistical Package for the Social Sciences (SPSS). UAUC and BOT will be conducted using the bar chat analysis. Both analysis methods are to identify the data received from workplace and result of the research. The paired T-test analysis is used for analyzed the differences between two means. In order to use a T-test, the same variable must be measured in different groups, at different times, or in comparison to a known population mean. Comparing a sample mean to a known population is an unusual test that appears in statistics books as a transitional step in learning about the T-test. The more common applications of the t-test are testing the difference between independent groups or testing the difference between dependent groups.

Meanwhile, bar chart analysis will be used to conduct the UAUC card and BOT card analysis. The bar chart analysis is easier compared from paired T-test analysis. From the bar chart analy-

sis, researcher can identified the difference between each element from UAUC and BOT card.

All the background information from workers was used in the study to assist the researcher to analyze the demography. Background information in this questionnaire included in Part A covering gender, age, position and years of experience to identify the workers demography. The average percentage is used to determine the workers demography for the various job ranks. Figure 4 below shows the workers demography involved in this study. It has shown the percentage of gender, age, position and working experience. The analysis results shown the majority workers gender for this study is 92% contributions are male while 8% contributions are female. According to the Figure 3, it can be summarized that 33% of workers age between 20-30 years old, 39% of workers age between 31-40 years old and 24% of workers age between 41-50 years old. Workers more than 50 years old are only 4% according to the results. The results shown 35% are general workers, 48% are skilled workers, and 11% are supervisory level while 6% from the total workers are engineer level (management representative).

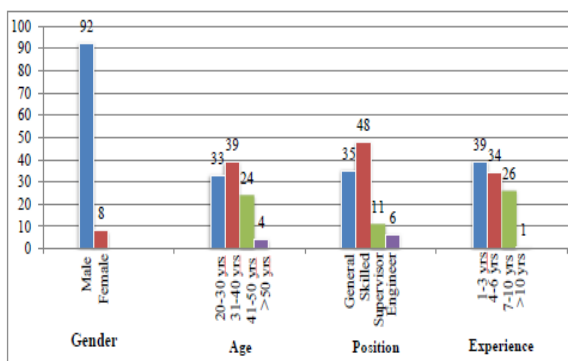


Figure 3-Workers Demography Analysis

We can summarized that 39% of the workers have working experience between 1-3 years, 34% of the workers experience between 4-6 years, 26% workers experience between 7-10 years and only 1% workers have experience more than 10 years.

Results of the analysis are as presented in Table 1. Based on the result, the paired sample t test is

significant, $t(79) = 20.35, p < .000, \eta^2 = .50$, and indicating that there are significant increase in score achievement from Pre-test ($M = 49.05, SD = 15.489, N = 80$) to Post-test ($M = 79.04, SD = 10.426, N = 80$). The mean increase for this study was 29.99, with the 95% confidence interval for the difference between the mean of 27.05 to 32.92.

Table 1- Result of Paired Sample T-test

	Mean	N	Std. Deviation	Std. Error Mean
Pre Test Before Training	49.05	80	15.489	1.732
Post Test After Training	79.04	80	10.426	1.166

	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower				Upper
Pre Test Before Training - Post Test After Training	-29.987	13.160	1.474	-32.921	-27.054	-20.350	79	.000

Figure 4 shows the amount of feedback that has been received from the workplace. The statistics show that receiving feedback on critical issues related to safety and health at work is decreasing before the study was conducted. We can see that the high volume of feedback is based on the unsafe condition (UC1) housekeeping.

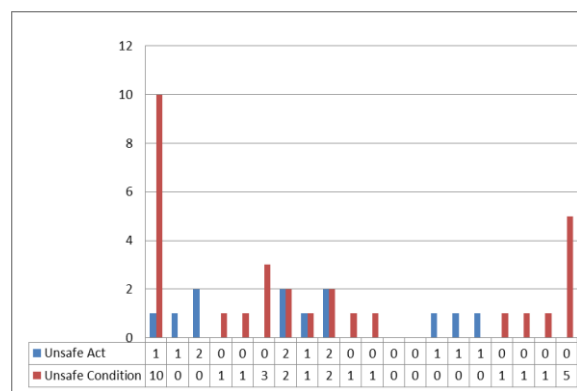


Figure 4. Workers Distribution UAUC Analysis

Figure 5 represents the number of Behavior Observation Tool card. The researcher can concluded that the increasing of safe work attitude has been implemented at a worksite by workers and this is a very favorable response in this study. Workers can demonstrate safe work attitude while performing their work after training has

been given during pre-mobilizations stage shows that the increasing of safety awareness among them is highly expected by the researcher.

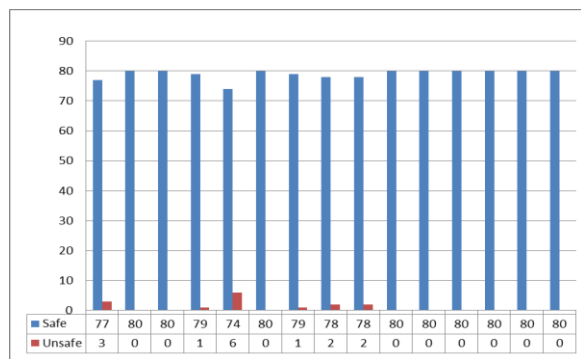


Figure 5. Workers Distribution BOT Analysis

DISCUSSION

In this chapter, a discussion on the findings in the literature based on pre and post-test result as the main data and UAUC and BOT as secondary data is provided. Discussion and conclusions on the research findings will also be described whether research meets the objective stated. All result are consistent in this study will then be considered as recommendation.

Paired T-test analysis shows the mean for pre-test is 49.05, while the standard deviation is 15.489. The standard error of the mean is 1.732. Post-test was conducted and the result showed that mean is increasing to 79.04, while standard deviation of 10.426 and standard error mean is 1.166. Based on T-test analysis, we can conclude that the increase in overall mean was 29.99 with a 95% confidence interval for the difference mean 27.05 to 32.92. These results demonstrated the effectiveness of the safety awareness program during the research.

Return analysis during this research has concluded the data received for UA1 is achieving our target and with low data reported. Analysis for unsafe act comparison between two projects is shown in Figure 6 and 7. It has shown a significant decrease of amount for current research project compare to other project

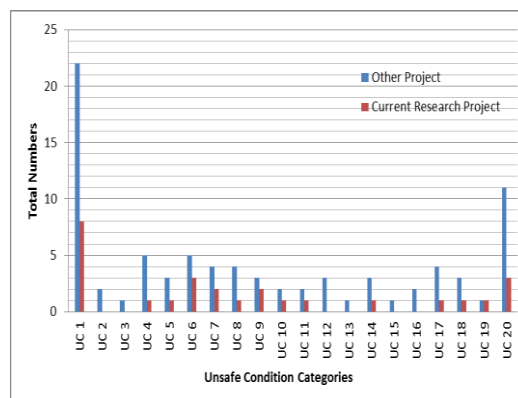


Figure 6- UA Analysis between Projects

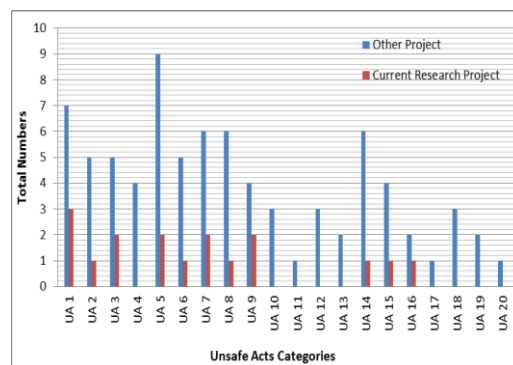


Figure 7- UC Analysis between Projects

Statistic in 2014 showed a higher ratio for UC1 received and we will study more into the UC1. Significant data received has shown outstanding performance in research. This is due to the program of research undertaken prior to mobilization stage. Training program and the sharing of knowledge has shown worker understood the training. Therefore, this has led to good result as expected.

Behavior observation has been conducted through the project execution and implement with the knowledge during the training. Figure 8 has shown the behavior observation tool card from workplace and found that performance is significant decrease from previous data performance 2014. Both comparisons were made to analyze data to measure performance. According to statistical data of 2014, we can conclude that item no 2, 4 and 6 needs more improvement. Based from the current study, the data analysis proves that there is an improvement on the three main focus issues i.e. item no. 2, 4 and 6 for

behavior observation. Once again, it has proved that the training program carried out during this study is acceptable to workers and continuous actions were monitored at workplace.

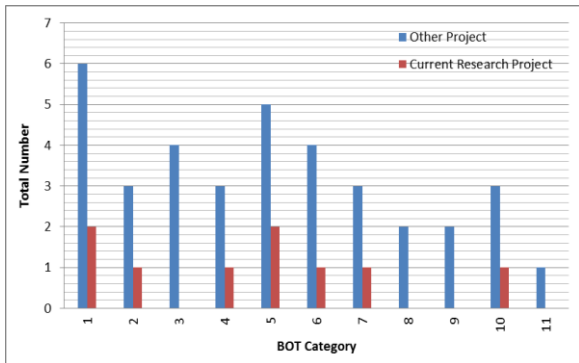


Figure 8- BOT Analysis between Projects

CONCLUSION

The mean increase was 29.99, with the 95% confidence interval for the difference between the mean of 27.05 to 32.92 have showed the successful research objective achieved. Table 2 shows the comparison between old and new pre-mobilization safety briefing. There is a lot of information that must be provided before mobilization to offshore. The time allotted for old safety briefing is only one hour will minimize the impact of safety briefing to the workers.

Table 2. Comparison of Pre-Mobilization Briefing

Old Safety Briefing	New Safety Briefing (Proposed)
<u>One day tentative</u> – HSE slot is only 1 hour (same day) during premob briefing.	<u>Two days tentative</u> – HSE slot 1 day (8 hrs) earlier from premob briefing.
1. Project Work Scope Presentation	1. Project Work Scope Presentation
2. Permit To Work Presentation	2. Permit To Work Presentation
3. Safety Briefing Presentation	3. Safety Briefing Presentation
4. Urine Drug Alcohol Test (UDAT)	4. Urine Drug Alcohol Test (UDAT)
5. Offshore Mobilization.	5. Offshore Mobilization.

Recent studies on the safety briefing highlighted several significant changes in terms of employee

understanding toward safety. Safety awareness training has been introduced in the new safety briefing prior to offshore mobilization. Implementation of the new program will take two days to ensure the programs running with sufficient time. This training is divided into two phases. The first phase is safety awareness training. It will be conducted on the first day of pre-mobilization briefing. During the training, pre-test will be carried out prior to the safety awareness training. Pre-test is conducted to identify workers understanding toward safety awareness. Meanwhile, post-test will be carried out at the workplace after 30 days of mobilization. The observation using UAUC card and BOT card will be carried out to assess workers behavior at the workplace according.

As a suggestion, researcher will recommend the outcome of this research to the management in regards to the implementation of this research. Researcher will propose the guidelines to the management on the areas of improvement according to this research. Proper guidelines will be created and follow accordingly while implement during pre-mobilization safety briefing in the futures mobilization across the organization. Figure 5.2 showed the difference approached pre-mobilization flowchart from traditional to new proposed pre-mobilization steps.

According to the Figure 9, it has showed the overall program flowchart carried out during the pre-mobilization safety briefing. The traditional pre-mobilization briefing is compressing the entire module as in Figure 5.2 to be conducted within a day and HSE department have been given only one hour slot for the safety induction and safety training.

The limitation of times given has affected the objective of the training and the result is not as expected. We conclude that the training is not achieving the objective of the program since the ratio of the data performance still not up to satisfactory level. Even worsen; it has been a con-

cern came from management for continual improvement that needs to be implementing accordingly. The findings of this research conclude that, time constraint has limit the interaction during conducting the training. Lack of information sharing due to time constraint regarding safety awareness will be caused the wrong interpreted toward workers at workplace. The important of knowledge sharing during safety awareness training is effective knowledge toward workers. Therefore, the research conducted in this study will propose a new method to be applied in the pre-mobilization since it has achieved the research target.

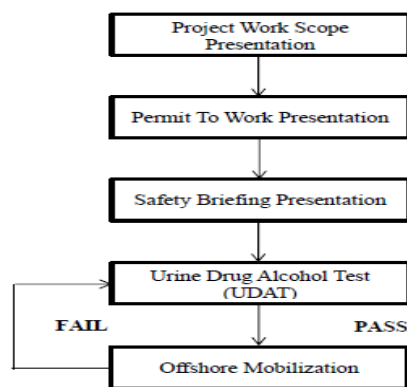


Figure 9- Pre-Mobilization Briefing Flowchart

We summarized that the new method of pre-mobilization briefing need to be conducted in two days for the safety briefing presentation is two days rather than one day according to the traditional pre-mobilization briefing. Recommendation suggested made for the safety briefing presentation in this research is to conduct one day earlier from the pre-mobilization safety briefing. Time duration suggested will be eight hours for the safety briefing since it will cover all the training and briefing. At the same time, it will focus us to explore the level of awareness among workers while conducting pre-test questionnaire prior to the training given and from the questionnaire test result we can identify the level of the workers.

Knowledge sharing is importing part for the training which needs more time to conduct with proper training syllabus. This research has proven the effectiveness of the training and received achievable result more than expected. With the increasing of the understanding of workers by gauging through the pre-test and post-test questionnaire, it has showed the effectiveness toward workers understanding regarding the training. Apart from that, workplace monitoring through unsafe acts unsafe condition and behavior observation also has shown the result as expected.

The improvement comparison has showed that this research has achieved the objectives. A way forward in regards to this research to recommend and implements the finding of this research toward company during offshore mobilization safety briefing and prior to crew embarkation to offshore workplace.

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