Indication of Decision Making through Accident Prevention Resources among Drilling Crew at Oil and Gas Industries: A Quantitative Survey

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Abstract. The aim of the present article is to determine the decision making potential of drilling crew by utilizing the available accident prevention resources at onshore and offshore oil and gas industries. In this study descriptive quantitative approach has been used to indicate the existing accident prevention resources appropriateness for accident prevention during oil and gas drilling operation. Similarly, 75 health and safety professionals and drilling crew has been randomly selected for this online survey from around the globe. For data analysis SPSS 22.0 software has been adopted to examine the gathered data in systematic way. According to the findings, it has been indicated that there is a lack of adequate health and safety resources at onshore and offshore oil and gas industries. Similarly, there is also a sheer need for decision support system based on effective hazard controlling measures to reduce the workplace risk and hazards. Also, it has been identified that the most of drilling crew neglect the safety and health precaution and policies during operation which cause them injuries. The findings of this research can facilitate the future researchers and industries to overcome identified issues through appropriate solution of addressed problems in effective way.

1. Introduction
Oil and gas industries play a very effective role in the acceleration of world’s economy from decades [1]. One of the major processes in these industries is the extraction of cured oil and natural gases from the ground and deep sea bed [2]. Likewise, oil and gas drilling process and their associated activities are considered as highly hazardous and risky [3]. Therefore oil and gas drilling operation is reported as one of the challenging and dangerous profession in the world at both oil and gas drilling domains (Onshore and Offshore) [4]. Furthermore, most of the lifethreatening events and hazardous condition

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occur due to the negligence of safety and health precautions and regulations [4]. Also, due to the inadequate safety and health resources and efficient decision making systems based on effective hazard controlling measures [5]. Thus, hundreds of peoples died annually during oil and gas drilling operation due to improper decision making at hazardous conditions during onshore and offshore operations worldwide for accident prevention [6]. Correspondingly, this study aimed to indicate the decision making potential of oil and gas drilling crew to by using the available resources provided by their organization for safety and health awareness and hazard and risk reduction during drilling activities at onshore and offshore sites.

2. Problem statement
Petrochemical extraction process is considered as one of the most complex and risky operation in oil and gas sector [7]. Every year many onshore and offshore drilling crew reported with lifethreatening injuries and on job fatalities due to the negligence of safety standards [4]. There is numerous health and safety hazards are involved through the drilling operation such as, safety hazard, chemical hazards, ergonomic hazards and environmental hazards [8]. Therefore the drilling operation is also specified as unpredictable operation due to its hazardous nature. Similarly, the major cause which has been indicated by some previous researchers are the inadequate accident prevention materials and recourses based on suitable hazard controlling information and knowledge provided by industries to the drilling crew at both drilling domain [9]. Due to insufficient accident prevention materials drilling crew and safety professionals are unable to take appropriate decision during any hazardous condition which cause them life time disabilities and also damage of industrial equipment [10]. Therefore, this study focused on the identification of the decision making potential of drilling crew through accident prevention available resources in oil and gas extraction process.

3. Objective
This paper focused to achieve following objective:
   a. To determine the decision making potential of drilling crew through accident prevention resources in oil and gas drilling operation

4. Methodology
In this research, data has been randomly collected from seventy five (75) drilling crew and safety professionals through online safety and health forums as shown in table 1. According to Asian marketing research, the Internet based data collection from distant respondent is determined to be the most sufficient and reliable [11]. Similarly, the gathered data has been analyzed by using SPSS version 22.0 to examine the percentage for each item of the distribute research questionnaire.

The questionnaire was divided in to three parts the first part was about the demographic information of the participants which included the gender, type of industry, origin and designation. Similarly, the second part contains thirteen query items for detering the decision making potential through accident prevention resourced for oil and gas drilling operation. The question has validated from three safety and health field experts from different oil and gas industries.
Table 1. Targeted online platforms

| Targeted Online Platforms |
|---------------------------|
| 1) Gulf National Drilling Company |
| 2) AB Drilling Company |
| 3) Drilling Off shore Malaysia |
| 4) Drilling Engineers |
| 5) Drilling Fluids |
| 6) Drilling Engineer and Drilling supervisor |
| 7) Drilling Rigs Onshore |
| 8) Well Drilling Institute |
| 9) Saudi Oil and Gas Safety |
| 10) Oil and gas Jobs and Discussion |
| 11) HSE Oil and gas forum |

5. Results and findings
Respondents for this study are 75 health and safety practitioners from oil and gas drilling industries. The collected data is analyzed by using Statistical Packages for Social Sciences (SPSS 20). In figure 1, it shows the percentage based on respondent’s gender. For this study, 68 respondents are male which carrying 91%. Meanwhile, there only 7 female respondents were involved in this preliminary study which is equal to 9%.

Figure 1. Pie Chart for Respondents Gender

5.1 Respondents based on origin
In figure 2, it shows the number of respondents and percentage based on respondent’s origin. For this preliminary study, 12 respondents are from Europe, 17 from Asia, 03 from North America and 41 from Middle East which carrying highest percentage 55%.
5.2 Respondents based on designation
In figure 3, it shows the number of respondents and percentage based on respondent’s designation. For this study, 20 respondents are safety officers, 11 are manager, 10 are supervisor and 34 are drilling crew which carrying highest percentage 45%.

5.3 Respondents based on type of industry
In figure 4, it shows the number of respondents and percentage based on respondent’s type of industry. For this preliminary study, 34 respondents are working in offshore oil and gas industry and 41 are working in onshore oil and gas industry which carrying the highest percentage 55%.
Effective hazard controls for workplace injuries

5.4 Effective hazard controls for workplace injuries

Health and safety practitioners responded on the query which was about “Does your organization use effective hazard control such as engineering controls (i.e. adjustable Workstations, mechanical lifting devises, ventilation systems, etc.) and/or administrative controls (i.e. job rotation) to prevent or control workplace injuries and illnesses?” 89% of them said that the organization didn’t use engineering controls or administrative controls (i.e. job rotation) to prevent or control workplace injuries and illnesses as specified in table 2.

Table 2. First query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 8                    | 11             |
| NO       | 67                   | 89             |
| Total    | 75                   | 100            |

Safety posters, health fairs to promote health and safety

5.5 Safety posters, health fairs to promote health and safety

As shown in table 3, participants indicated in response of query which was about “Does your organization use safety posters, health fairs, etc. to promote health and safety in drilling?” 65% of them said that their organization didn’t use safety posters, health fairs, etc. to promote health and safety in drilling already study the course of digital electronics.
Table 3. Second query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 26                   | 35             |
| NO       | 49                   | 65             |
| Total    | 75                   | 100            |

5.6 Safety officer provide adequate resources for accident prevention
Study participants responded on the query of questionnaire which was about “Did safety officer provide adequate resources for accident prevention during drilling process?” 83% of them said that the safety officer didn’t provide adequate resources for accident prevention during drilling process as indicated in table 4.

Table 4. Third query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 13                   | 17             |
| NO       | 62                   | 83             |
| Total    | 75                   | 100            |

5.7 Drilling crew follow established safety rules
As revealed from table 5, health and safety professionals responded on the item which was about “Did drilling crew follow all established safety rules and procedures?” 61% of them said that the drilling crew follows all established safety rules and procedures.

Table 5. Fourth query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 29                   | 61             |
| NO       | 46                   | 39             |
| Total    | 75                   | 100            |

5.8 Supervisor review and respond promptly to employee safety
Participants responded on the question which was about “Did supervisor review and respond promptly to employee safety suggestions?” 83% of them said that the supervisor didn't review and respond promptly to employee safety suggestions as indicated in table 6.
Table 6. Fifth query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 13                   | 17             |
| NO       | 62                   | 83             |
| Total    | 75                   | 100            |

5.9 Workplace injuries and illnesses during drilling reported

As shown in table 7, Health and safety practitioners responded on twenty first query of questionnaire which was about “Are all workplace injuries and illnesses during drilling reported and investigated?” 72% of the respondents said that all workplace injuries and illnesses during drilling didn’t report and investigated.

Table 7. Sixth query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 21                   | 28             |
| NO       | 54                   | 72             |
| Total    | 75                   | 100            |

5.10 Supervisors and managers been trained in accident investigation

Participants responded on the item which was about “Have all supervisors and managers been trained in accident investigation procedures specifically for drilling operation?” 91% of them said that supervisors and managers didn’t train in accident investigation procedures specifically for drilling operation as specified in table 8.

Table 8. Seventh query

| Response | Number of Respondent | Percentage (%) |
|----------|----------------------|----------------|
| YES      | 7                    | 9              |
| NO       | 68                   | 91             |
| Total    | 75                   | 100            |
5.11 Supervisors required to complete a separate accident investigation report
As shown in table 9, health and safety practitioners responded on the query of questionnaire which was about “Are supervisors required to complete a separate accident investigation report?” 92% of them said that the supervisors didn’t complete a separate accident investigation report.

| Are supervisors required to complete a separate accident investigation report? | Number of Respondent | Percentage (%) |
|---|---|---|
| YES | 6 | 08 |
| NO | 69 | 92 |
| Total | 75 | 100 |

5.12 Safety coordinator promptly notified when a serious accident occurs
On the question which was about “Did Is the safety coordinator promptly notified when a serious accident occurs?” 84% of respondents said that the safety coordinator didn’t promptly notify when a serious accident occurs, as shown in table 10.

| Did Is the safety coordinator promptly notified when a serious accident occurs? | Number of Respondent | Percentage (%) |
|---|---|---|
| YES | 12 | 16 |
| NO | 63 | 84 |
| Total | 75 | 100 |

5.13 Organization conduct exposure monitoring
Participants responded on the query of questionnaire which was about “Does your organization conduct exposure monitoring when required by a particular OSHA Standard or when requested by employees?” 56% of them said that the organization conduct exposure monitoring when required by a particular OSHA Standard or when requested by employees as shown in table 11.

| Does your organization conduct exposure monitoring when required by a particular OSHA Standard or when requested by employees? | Number of Respondent | Percentage (%) |
|---|---|---|
| YES | 42 | 56 |
| NO | 33 | 44 |
| Total | 75 | 100 |
5.14 Accident prevention programs

Health and safety practitioners responded on the question which was about “Are accident prevention programs and activities based upon an analysis of accident reports and injury and illness rates?” 60% of them said that the accident prevention programs and activities didn’t base upon an analysis of accident reports and injury and illness rates as shown in table 12.

Table 12. Eleventh query

| Are accident prevention programs and activities based upon an analysis of accident reports and injury and illness rates? |
|---------------------------------------------------------------|
| Response           | Number of Respondent | Percentage (%) |
| YES                | 30                   | 40             |
| NO                 | 45                   | 60             |
| Total             | 75                   | 100            |

5.15 Company use decision support systems for decision making

On the query of questionnaire which was about “Does your company use decision support system for decision making to reduce workplace risk and hazards during drilling process?” 61% of participants said that their company didn’t use decision support systems for decision making to reduce workplace risk and hazards during drilling process, as indicated in table 13.

Table 13. Twelfth query

| Does your company use decision support systems for decision making to reduce workplace risk and hazards during drilling process? |
|---------------------------------------------------------------------------------------------------------------------|
| Response           | Number of Respondent | Percentage (%) |
| YES                | 29                   | 39             |
| NO                 | 46                   | 61             |
| Total             | 75                   | 100            |

5.16 Company provide electronic application for accident prevention to employees

Health and safety professionals responded on the item which was about “Does company provide any electronic application for accident prevention to employees?” 81% of them said that they the company didn’t provide any electronic application for accident prevention to employees, as shown in table 14.

Table 14. Thirteenth query

| Does company provide any electronics application for accident prevention to employees? |
|---------------------------------------------------------------------------------------|
| Response           | Number of Respondent | Percentage (%) |
| YES                | 14                   | 19             |
| NO                 | 61                   | 81             |
| Total             | 75                   | 100            |
6. Conclusions
The overall findings of this study indicates that the decision making potential during hazardous condition through accident prevention resources in oil and gas drilling process indicated that there have sheer needs of electronic applications and decision support systems based on effective hazard controlling measure as per health and safety international rules and regulations for safe drilling operation. According to the quantitative findings as shown in figure 5, it has been investigated that the drilling crew didn’t follow the safety instructions and precautions properly during oil and gas well drilling at both offshore and onshore oil and gas operations which cause them sever injuries and sometime death. Similarly, the findings also revealed that the most of organizations not provide adequate safety awareness materials and effective investigations training programs to the drilling crew and safety professionals.

![Figure 5. Cumulative findings](image)

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