Journal of Positive Sciences (JPS) eISSN: 2582-9351, https://positive-sciences.com JPS. 2021 Aug; 1(5): 142-147

Article info
Received on: 26.07.2021
Accepted on: 30.08.2021
Published on: 31.08.2021
doi: https://doi.org/10.52688/ASP19505

Research Article

Optimization of safety management systems in engineering projects using pilot study

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ABSTRACT

Safety management system is vital for oil and gas projects, Organizations center around Process Safety Management to shield employees and offices from mishaps, like blasts and terminates. Most components of PSM are firmly identified with employees, which decide the hierarchical culture, and authoritative culture straightforwardly influences process safety management. Organizations put a push to have a solid safety culture, which is practices and reactions with respect to crisis and unusual circumstances. This study involves survey to investigates the level of awareness of safety standards in petrol and gas sectors. The outcomes of this study involves stating of set of recommendations that vital for safety skills improvement in the designated study sample.

Keywords: Safety, ISO-50001, management, neural networks, remote locality

INTRODUCTION

As new technologies are developed, industry processes become more complicated. The processes are required to involve lots of factors, which were not used before, in order to produce perfect products. As a result, people receive the benefits from high quality with the low price of products, and companies also flourish their business and invest more capital to develop their technologies to make better products with low costs. However, these changes, ranging from simple to complicated, are accompanied by risks of process failure as well [1].

The risks not only affect their business but also can be connected with the safety of the workers and the general public. In the pharmaceutical and oil industries, handle hazardous chemical materials the most, a single small failure in Process Safety Management (PSM) can bring about extreme damages and casualties [2]. Due to this high risk followed by failure in the process, process management becomes important to secure safety and must be precise and delicate. For this reason, chemical companies have been concentrated on PSM to reduce accidents in the workplaces, and Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), Center for Chemical Process Safety (CCPS) issued PSM guidelines to reduce risks and prevent accidents before it happens. Even though those guidelines were provided to companies, diverse accidents occurred by failures of process management in the last few years, which could have been prevented and minimized the damages by PSM. For example, the West Fertilizer Company explosion in 2013 resulted in 15 fatalities, more than 260 injuries, and widespread community damage. Incidents from the failure of PSM reminded people of its importance and made people reconsider the causes of the failure of PSM [3]. To understand why the accidents keep occurring, it is important to know what the references cover. The references published by organizations commonly mention probable hazard factors, operating procedures, emergency planning, incident investigations, employee training, and participation. Even though all the technology and equipment are managed as references by companies, it is difficult to fully assure that employees are following the regulation. Based on the conditions of PSM, the results of the process would be different due to human forces. It is because individuals have different perspectives and knowledge in equipment, processes, environment, and safety. In addition, the perspective and knowledge of employees are also different from company to company [4].

On 11 December 2005, blasts and flames happened at the Bunce field oil stockpiling and move a stop, Hemel Hempstead, U.K. Bunce field (2007) featured in the occurrence report that the fundamental driver of the spread of harm came about because of the start of a fuming cloud-delivered from spilled gasoline by overloading a capacity tank during the evening.Through examination, it was shown that the conceivable reason was likely the weak level measure which potentially abrogates as far as a possible safety switch and programmed PC activity to stop the filling process which prompts this appalling occasion [5]. Aside from that, the lamentable occasion of the Flixborough mishap has brought the meaning of the management of progress (MOC) obviously when

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it includes the brief change to channeling between cyclohexane oxidation reactors As indicated by computer-based intelligence NOFK lab2 (2007), with an end goal to look after creation, a transitory detour line was introduced around a fifth of a progression of six reactors at an office in Flixborough, England, in the Spring of 1974. The detour fizzled while the plant was being restarted after irrelevant fixes on June 1, 1974, delivering around 60,000 pounds of hot process material, made generally out of cyclohexane. The subsequent fume cloud detonated, yielding an energy discharge identical to around 15 tons of dynamite [8,9].

The blast totally obliterated the plant and harmed close by homes and organizations, executing 28 employees, and harming 89 employees and neighbors. In view of the report of the mishaps, the transitory adjustment was built by people who were awkward in planning huge lines outfitted with roars. Subsequently, this mishap can be maintained at a strategic distance from if there is a viable MOC framework that can identify the plan blemish before the change was carried out.

METHODOLOGY

Total questionnaires of twenty-five questions that split into five categories are distributed amongst forty petroleum professionals including engineers and technical staff as well as labours. We filtered the candidates as per their education qualification so that some criteria are maintained for sake of candidates inclusion decision and candidate exclusion decision. Study is conducted in fever of petrol projects that are under Ministry of Oil, Iraq and this research is aiming to measure the level of safety awareness and develop efficient management roles for petroleum project [6, 7].

H1: Locality where the petroleum projects are established has vital impact on workers/professionals safety.

H2: international (globalized) safety standards such as (ISO 50001) are outperformed in the cost reduction formula.

H3: Globalized safety codes are essential irrespective of presence of nationalized safety codes.

H4: Impact of data sciences and smart technologies such as safety management systems is vital for human life in petroleum industry.

H5: It is essential for breakeven from any petroleum projects to ignore the environmental constrains.

BIOMETRICAL RESULTS

As results obtained for all the candidates, pre-processing is performed in order to convert the responses into numerical format. However, gender distribution was determined by calculating the number for male candidates those are replied to the said survey within the defined period and fallen under the inclusion criteria. There were total thirty-nine candidates who are finally settled with the said survey. Out of which twelve are females and twenty-seven are males. Figure below is showing the same.

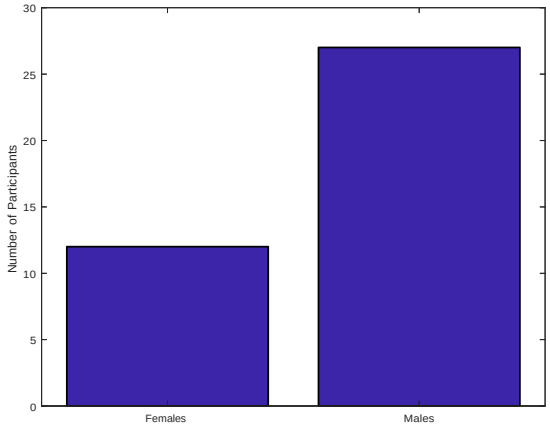

Figure 1: Gender distribution vs number of candidates

Candidates were under intensive investigation to evaluate their fitness into the survey through studying their education criteria according to the inclusion conditions. Three categories are made which are Diploma, Bachelor and Master. However, it was referred to the higher educations such as master, doctoral and post-doctoral by the term Master and higher in the survey. Figure show the results obtained from this stage where the distribution of the total survey participants over the educational categories. Results shown that most of the candidates are with bachelor degree including engineers and technical professionals. The second largest population is seen having diploma degree which mostly the workers and professional labours and finally around fifteen percent of the total workers are seen with higher education including the research scholar and consultant engineers and designer.

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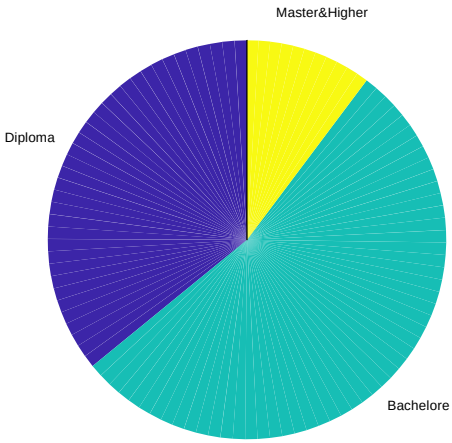

Figure 2: Educational qualification distribution vs number of candidates

The other stage of verification that fall under the said inclusion criteria is whither the candidate is received extra training or education in regards to the skills improvement. However, this stage is a supportive stage and not essential for excluding the particular candidate. Figure below is demonstrating the results of this stage. Results shown that most of the candidates are not received any training or skill development coerces. Around twenty percent of them are received those particular courses.

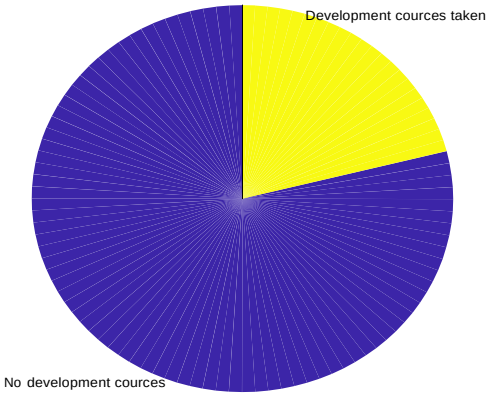

Figure 3: Skill development courses vs number of candidates

Form the other hand, here we imitated the survey for finding whither all the candidates are oil and gas professional staff. We found that around twelve percent of them are not physically worked with oil and gas field. Those people are included into he survey because they are mostly a research scholar and project designers with oil and gas interest, figure below is demonstrating the same.

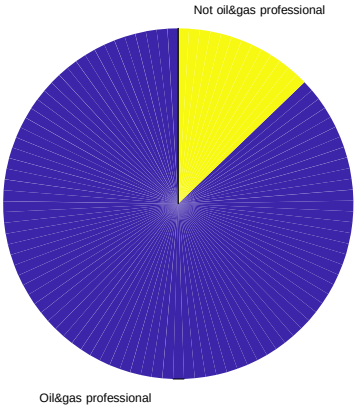

Figure 4: Oil and gas relevant experience vs number of candidates

Experience is being obtained within four groups namely: one to five years, six to ten years, eleven to twenty years and twenty-one to thirty years. It was considered that thirty years old is the border line for the service and minimum experience is one year. Results shown that most of the included candidates are of eleven to twenty years. Figure below is demonstrating the same.

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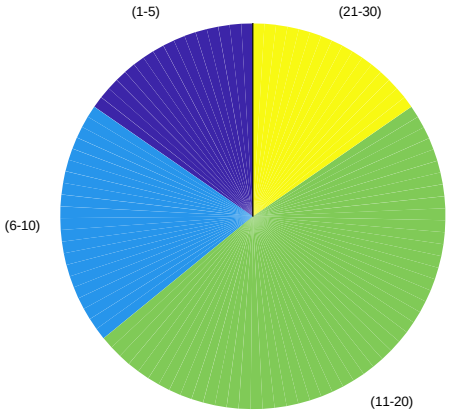

Figure 1: Years of experience vs number of candidates

RESPONSE ANALYSIS

Every hypothesis is constructed with help of five questions in the survey, the same is explained in the above sections. However, this section is illustrating the impact factor for each question using the scores obtained by Delphi method. The neutral responses are firstly for each question. Table 1 is demonstrating the results of every response i.e. neutral, agree, disagree and strongly agree. The discussion of the responses foe each question is given below:

Table 1: Count of responses as per the categories

Question Number	Neutral	Strongly-Agree	Strongly-disagree	Agree	Disagree
1	27	0	0	5	7
2	8	0	9	9	13
3	0	22	0	17	0
4	3	17	0	18	1
5	4	7	11	9	8
6	10	0	10	2	17
7	21	0	0	15	3
8	8	4	0	27	0
9	16	0	0	20	3
10	12	0	0	21	6
11	1	5	6	16	11
12	16	7	0	16	0
13	9	0	0	25	5
14	11	0	0	27	1
15	16	0	0	23	0
16	5	13	0	21	0
17	14	9	0	16	0
18	14	0	0	20	5
19	7	0	12	11	9
20	8	10	0	20	1

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21	0	0	13	3	23
22	10	0	1	15	13
23	4	12	0	23	0
24	19	0	0	9	11
25	4	16	0	19	0

Responses can be summarized by calculating their impact with reference to the total impact as in Table 2.

Table 2: Total count of each response (comparison)

Responses	Number of responses
Neutral	274
Strongly-Agree	122
Strongly-disagree	62
Agree	407
Disagree	137

With help of Delphi method hypothesis that stated above are being examined with references to the responses above. Table 3 is illustrating the score of each question and then pointing out the hypothesis label of the same question.

Table 3: Hypothesis test and decision

Label	Statement	Decision	Score
H1	Locality where the petroleum projects are established has vital impact on workers/professionals safety	Rejected	103.83
H2	International (globalized) safety standards such as (ISO 50001) are outperformed in the cost reduction formula	Rejected	56.41
H3	Globalized safety codes are essential irrespective of presence of nationalized safety codes	Approved	130.76
H4	Impact of data sciences and smart technologies such as safety management systems is vital for human life in petroleum industry	Approved	144.87
H5	It is essential for breakeven from any petroleum projects to ignore the environmental constrains	Rejected	64.102

CONCLUSION

This study was made to evaluate the safety norms and to assess the knowledge of safety and project management in the fields of oil and gas. Twenty five questions ae distributed among many of candidates and candidates are filtered according to previously set inclusion and exclusion criteria. The overall thirty-nine candidate are reported approved for this survey participation. Questions are made in such way that each five questions are serving one hypothesis so that total five hypothesises are set. The results are obtained after data pre-processing using Matlab Software. Results are analysed using Delphi method and it revealed that only two hypothesis are approved i.e. “Impact of data sciences and smart technologies such as safety management systems is vital for human life in petroleum industry” and “Globalized safety codes are essential irrespective of presence of nationalized safety codes”.

REFERENCES

[1] Jiang F, et al., “Artifcial intelligence in healthcare: past, present and future”, Stroke Vasc Neurol, 2017.
[2] Wiens J, et al, “Machine learning for healthcare: on the verge of a major shift in healthcare epidemiology”, Clin Infect Dis. 2018.
[3] Davenport T, et al., “The potential for artifcial intelligence in health care”, Fut Healthcare J. 2019.
[4] Deng L, et al, “Deep learning: methods and applications”, Found Trends Signal Process, 2014.
[5] LeCun Y, et al,“Deep learning”, Nature, 2015.
[6] Dlamini Z, et al,“Artifcial intelligence (AI) and big data in cancer and precision oncology”, Comput Struct Biotechnol J., 2020.

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[7] Kumar R. , et al,"Artifcial intelligence basics, In: Machine learning and cognition in enterprises" Springer; 2017.
[8] Aron J. , et al,"How innovative is Apple's new voice assistant, Siri", Elsevier; 2011.
[9] Kepuska V, et al, "Next-generation of virtual personal assistants (microsoft cortana, apple siri, amazon alexa and google home)", In CCWC IEEE, 2018.

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