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Original

Implementation of Health, Safety and Environment Management System (HSE-MS) Requirements with Emphasis on Payment Management

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ABSTRACT

Background: In this study, the implementation of the requirements of health, safety and environment management system with emphasis on payment management in contracting companies have been compared. **Methods:** The current research is a cross-sectional study in which 200 persons were randomly chosen from a Krejcie and Morgan table as a sample (159 contractors of the gas company and 41 of the two contractors of the water and wastewater company). Two questions created by the researcher were included in the data gathering instrument. The first questionnaire included ten questions comparing HSE standards, while the second questionnaire had 28 questions comparing the two organizations' health, safety, and environmental indicators. Descriptive statistics and t-test were used to analyze the data. **Results:** The questionnaire's validity (qualitative content analysis) and reliability (Cronbach's alpha) were both validated as a consequence of the findings (0.879). Based on the findings, it was discovered that the Gas Organization's contracting companies implement the requirements of the health management system and safety better than the Water and Sewerage Organization of South Khorasan Province, and that the reason for this appropriate situation is the Gas Organization's emphasis on payment management ($P<0.001$). **Conclusion:** The results showed that the implementation of health, safety, and environmental management system requirements in the contracting companies of the Gas Organization are better than the Water and Sewerage Organization of South Khorasan Province. There are various aspects at play, and one of the most significant in the correct circumstances is the gas company's concentration on payment management.

Keywords: Health, Safety and Environment Management System; Payment management; Contracting companies.

Introduction

Many companies, organizations, large and small industries, such as oil, gas, and petrochemicals, have concluded that the prevention of damage and accidents, as well as health, safety, and the environment, necessitates the establishment of an integrated health, safety, and environmental management system.[4] With this method and its use in project management, it is also possible to protect the health and safety of workers, customers, contractors, and other people, as well as a healthy environment, in order to create sustainable development and boost productivity.[16] Projects to contractors, contractor HSE management, and contractor compliance with HSE regulations are all

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the responsibility of the employer, and both are dedicated to safeguarding employee health and safety as well as the environment.[13] Monitoring and evaluating the performance of industries has also expanded dramatically. As a result, addressing HSE concerns in contracting activities is critical.[7] Contractors should identify rejection) and a process for monitoring contractor HSE performance should be devised. Furthermore, concerns of health, safety, and the environment should be addressed in contracting operations in order to constantly enhance contractors' HSE performance.[10]

In these industries, effective efforts are also made to promote and enhance safety, health, and environmental performance. Working in contractual contexts has a significant risk of safety, health, and environmental mishaps due to the variety of workers, the existence of multiple working groups, and the lack of total knowledge with the environment and working circumstances.[3] Payment management is one of the control methods for paying attention to health, safety, and the environment in contracting operations. Some firms control the execution of the standards of the health, safety, and environmental management system before paying the contractors, and then the payment status statement is signed and paid, while other companies do not.[9]

Ten contracting firms and two contracting companies with several hundred employees operate in the South Khorasan Gas Company's contracting system, each of which must prioritize health, safety, and environmental problems as key considerations. Also, follow the HSE's guidelines or checklist. To preserve the health of contractors' troops, equipment, facilities, and the environment, officials should keep an eye on their health, safety, and environmental concerns. Workers' health will be jeopardized if HSE regulations are not followed.[10] Its impact on accident reduction is a critical concern. As a result, the goal of this research is to evaluate the HSE standards in the contracting businesses of the Gas Company and the Water and Sewerage Company of South Khorasan Province, with a focus on payment management, in order to elucidate some of the probable impacts on minimizing workplace accidents.

Methods

The study population comprises all health, safety, and environmental specialists and technical forces of contracting firms under the South Khorasan Gas Company, which has ten companies with 350 individuals (experts, technical force, and employees), as well as the South Khorasan Water and Sewerage Company. There are 70 persons in two firms (experts, technical staff, and employees) (420 people in total). The Krejcie and Morgan table yielded a sample size of 201 people. This research used a basic random sampling procedure, with 159 gas company contractors and 41 water and sewage company contractors chosen as the sample. [1,5]

The library method was employed to gather information on theoretical foundations and relevant research records for this study. A checklist of HSE indicators and a questionnaire created by the researcher to assess the impact of certain HSE standards on safety performance are included in the data collecting instrument. Accidents in the workplace are assessed by contractors. In this study, two types of questionnaires were used to collect data in order to compare how the Gas Organization and the Water and Sewerage Organization of South Khorasan Province implemented the requirements for health, safety, and environmental management indicators in their contracting companies. The first questionnaire has ten items, while the second contains questions on health, safety, and the environment. Optional responses are based on qualitative data and are expressed as very good, good, average, very good, bad, and extremely poor. These data are then numbered from 1 to 5 in the following phase. To verify the researcher's questionnaire, its content validity was established using the technique of expert consensus and qualitative content analysis, and its reliability was

determined using the Cronbach's alpha calculation method, as shown in Table 1.

The internal consistency (reliability) of the questionnaire and the measuring tool's reliability coefficient were calculated using Cronbach's alpha technique. After preparing the questionnaire, the distribution method was used to distribute the checklist of HSE indicators and the questionnaire of workplace accidents and accidents for collection, and the required information was collected by referring directly to the statistical sample, by distributing and filling out the checklists and questionnaires. Table 2 shows the needs assessment form for a health, safety, and environmental management system, with a focus on payment management in contracting organizations.

SPSS software version 21 was used to analyze the data. The frequency distribution indices, frequency percentage, mean, and standard deviation are used in the descriptive statistics part, whereas the independent t-test is utilized in the inferential statistics section.

Results

Regarding the results of the questionnaires, it can be observed that:

- In two organizations, the majority of the responses were males (153 men and 2 women in the gas organization and 39 men and 2 women in the water and sewage organization).

- The majority of respondents in the Gas Organization's contracting firms were between the ages of 30 and 40 years (21 persons) and in the Water and Sewerage Organization's contracting companies were between the ages of 30 and 40 years (89 people) (21 people)

- The majority of respondents held a bachelor's degree in the Gas Organization's contracting firms (134 persons) and a bachelor's degree in the Water and Sewerage Organization's contracting companies (30 people).

Table 3 shows the results of a study of ten HSE criteria between the contracting firms of the two organizations, gas and water, wastewater. Independent t-analysis revealed that there was a significant difference in the mean values of all variables evaluated between the two gas firms. Water and sewage have a considerable difference; in all categories, the gas contracting firm has a higher rating than the water and sewage company. The T-test was utilized to compare the means of the two groups since the research data was quantitative and normal.

Table 1. Calculation of validity and reliability of the questionnaire

Parameter	Questions	Cronbach's alpha
HSE requirements	1-10	0.855
Assessing the safety performance of contractors	1-8	0.886
Assessing the health performance of contractors	9-19	0.903
Assessing the environmental performance of contractors	20-28	0.872
Final		0.879

Table 2. Health, safety and environmental management system requirements evaluation form by the emphasis on payment management in the contracting companies

A score of 1 means very weak, a score of 2 means weak, a score of 3 means average, a score of 4 means good and a score of 5 means very good.						
Relevant Organization: Gas Company O Water and Sewerage Company O						
Row	Evaluation criteria	Performance				
		1	2	3	4	5
1	Implementation of document control system					
2	Organizing human resources and determining roles, responsibilities and job descriptions					
3	Planning and deployment of risk management system					
4	Training system planning					
5	Emergency planning					
6	Incident reporting and analysis					
7	Management and performance evaluation					
8	Maintenance management					
9	Launching the Committee for Technical Protection and Occupational Health					

Table 3. Comparing the mean of evaluation indicators in the contracting companies of Gas Organization and the Water and Sewerage Company (in terms of mean ± standard deviation)

Evaluation criteria	Relevant organization	Mean ± standard deviation	T	Degree of freedom	P-Value
Implementation of document control system	Gas organization Water and Sewerage Organization	4/43 ± 0/624 1/51 ± 0/595	33/889	198	<0/001
Organizing human resources and determining roles, responsibilities and job descriptions	Gas organization Water and Sewerage Organization	4/48 ± 0/624 1/59 ± 0/595	30/455	198	<0/001
Planning and deployment of risk management system	Gas organization Water and Sewerage Organization	4/32 ± 0/723 1/65 ± 0/757	25/503	198	<0/001
Training system planning	Gas organization Water and Sewerage Organization	4/58 ± 0/535 1/58 ± 0/572	38/307	198	<0/001
Emergency planning	Gas organization Water and Sewerage Organization	4/45 ± 0/609 1/64 ± 0/644	31/700	198	<0/001
Incident reporting and analysis	Gas organization Water and Sewerage Organization	4/37 ± 0/661 1/64 ± 0/732	27/673	198	<0/001
Management and performance evaluation	Gas organization Water and Sewerage Organization	4/41 ± 0/621 1/53 ± 0/611	33/067	198	<0/001
Maintenance management	Gas organization Water and Sewerage Organization	4/54 ± 0/540 1/47 ± 0/594	38/257	198	<0/001
Launching the Committee for Technical Protection and Occupational Health	Gas organization Water and Sewerage Organization	4/45 ± 0/557 1/62 ± 0/663	32/665	192/286	<0/001
Audit and review	Gas organization Water and Sewerage Organization	4/34 ± 0/670 1/57 ± 0/671	29/223	198	<0/001

Discussion

The purpose of this research was to examine the implementation of the requirements of the health, safety, and environmental management system in the contracting businesses of the Gas Company and the Water and Sewerage Company of South Khorasan Province, with a focus on payment management. According to the findings, the Gas Organization's contracting firms follow health, safety, and environmental management system criteria better than the Water and Sewerage Organization's contracting companies, which might be attributed to the Gas Organization's concentration on payment management. Contractors are searching for the largest savings, which are mostly in the HSE sector, in order to boost their revenue and profits from projects. The research findings revealed that the Gas Organization's contracting companies are in a better position than the Water and Sewerage Organization in terms of document control, which includes control of all documents and information of the integrated management system at all stages of preparation, approval, publication and distribution, maintenance, review and change, revocation and obsolescence of documents. The executive technique of document management allows the organization to see all of the papers that have been generated and to avoid as many purposeful and unintended mistakes as feasible. The contracting companies of the Gas Organization are required to show the available documents in the inspections and inspections in order to receive the cost, in addition to presenting the documents for the supply of HSE equipment to this unit, but there is no such procedure in the provincial water department.

This criterion is more stringent in the gas industry than in the water and sewage industry. According to the findings of a study by Shafa'i Gholami et al. (2014), the index of organization and documentation is a key indicator in evaluating the HSE performance of petrochemical contracting companies, and its proper implementation necessitates proper executive interaction between the contractor and the employer's HSE unit.[13]

The study results revealed that the Gas Organization's contracting firms are in a stronger position than the Water and Sewerage Organization's contracting companies in terms of personnel organization and determining maps, duties, and job descriptions. The contractor must supply the workforce necessary for each project carried out by the gas organization's HSE unit, according to quantitative and qualitative estimations. Before hiring these people, the contractor must submit their documents to the organization's HSE unit, which must approve them before the contractor can hire them; however, there is no such procedure in place in the provincial water department, so this requirement is better in the gas organization than in water and sewage. According to the findings of Jafari et al. (2013) research, the index of manpower organization and determination of maps, duties, and job descriptions is one of the most important criteria in contractor HSE rating. As a result, before completing a contract with the contractors, the contractor must publish the number and degree of their people for the project in the form of a plan in the auction's HSE area before signing the contract.[6]

In terms of the planning index and the construction of a risk management system, the study results revealed that the Gas Organization's contracting firms are in a better position than the Water and Sewerage Organization's contracting companies. Despite the fact that the Water and Sewerage Organization provides the HSE unit a favorable grade by providing a table and program at the start of each year, the Gas Organization takes this process more seriously. Contracting companies must implement methods for early detection, analysis, and classification of hazards in order to identify health, safety, and environmental hazards in the field of work, as well as criteria for compliance with all legal environmental requirements and their definition, as well as conduct monthly site visits and document the results. Deliver the field to the gas organization's HSE section. As a consequence, the gas organization meets this criteria better than the water and sewage organization. One of the required variables for contractor eligibility, according to the Canadian Association of Petroleum Producers (2008), is the contractor's system for accident reporting and recording, risk management, accident evaluation, and analysis.[2]

In terms of the education system planning index, the study results revealed that the Gas Organization's contracting firms are in a better position than the Water and Sewerage Organization's contracting companies. The contractors' training method focuses on the necessity and the use of personal protection equipment, which they must supply to their employees before recruiting and operating. In addition, the contractor should take the company's employees to the provincial labor office to complete comprehensive HSE training and receive a work permit. These courses and their supervision are not provided by the Water and Sewerage Organization, and they are satisfied with a certificate of completion. Meanwhile, the gas company has mandated that all of its contractors get credentials from the province's professional technical body. Also, every six months, the contractor defines the training courses and determines which training courses will be offered in each month, and the organization's HSE representative attends and oversees these sessions. As a consequence, the gas organization meets this criteria better than the water and wastewater organization. According to the findings of Shafaei et al. (2014), one

of the elements determining contractor safety performance is offering safety and health training for all personnel and having varied methods for it.[13]

The research findings revealed that the Water and Sewerage Organization's contracting companies do not have an emergency plan at all, and the water organization does not pay attention to it at all; however, the Gas Organization has required contractors to define a plan for crisis management, such as a major fire, as well as the project's protection and safety and that of emergency personnel. As a result, this criterion is more stringent in the gas industry than in the water and sewage industry. According to the findings of Poursoliman et al. (2015), petrochemical contractors may build an emergency response strategy to avoid or limit accidents.[12]

In regards to the Accident Reporting and Analysis Index, the research findings revealed that contracting companies in the Water and Sewerage Organization should report the cause of the accident to the HSE unit in the event of an accident resulting in disability or death, or a large fire; however, contractors in the Gas Organization are required to report any small to large accident to the HSE unit within 3 hours of its occurrence. A meeting between the contractor and the HSE unit is held in the event of a major fatal accident to discuss the causes of the accident and ways to prevent it. The contracting business will be banned by the organization during the HSE unit's evaluation, and the gas company will not allocate it any work. As a result, this criterion is more stringent in the gas industry than in the water and sewage industry. According to the findings of Mahmoudi et al. (2016) research, having a good team for accident investigation is one of the factors to consider when hiring contractors from an HSE standpoint.[8] Incident reporting and analysis was specified as one of the safety sub-criteria by Yarahmadi et al. (2017).[15]

In terms of the Management Report and Performance Evaluation Index, the research findings revealed that contracting companies in the Water and Sewerage Organization submit a general report of HSE activities to the HSE unit at the end of each year, with no verification by the unit; however, contractors in the Gas Organization are required to report their actions to the HSE unit on a monthly basis before receiving their expenses, and one of the experts in this field confirmed this. If there was a contractor, his expenses would be covered. As a result, the Gas Organization is in a stronger position than the Water and Sewerage Organization to meet this need. The findings of Yarahmadi et al. (2017) suggest that performance assessment is an important part of any management system's continuous improvement process. Various organizations and industries should create indicators and ask their contractors to submit them at regular intervals to assess and monitor the effectiveness of the HSE management system.[15]

In relation to the Maintenance Management Report Index, the research findings revealed that the contracting companies in the Water and Sewerage Organization submit a general report of the measures related to the equipment and repair of their equipment to the organization's Deputy of Maintenance at the beginning of each chapter. Contractors in the gas organization, on the other hand, are expected to provide a monthly report on equipment to the HSE unit before collecting their expenses, covering equipment failure, actions taken to minimize faults, and how to maintain the equipment. The organization submits its application for verification, and if accepted, the contractor's monthly costs are paid. As a result, this criterion is more stringent in the gas industry than in the water and sewage industry. According to the findings of Shafa'i Gholami et al. (2014), management reports are particularly important in the field of maintenance management because they stabilize the maintenance unit's position for the organization's senior managers and show the path of movement and improvement of maintenance unit activities. Repairs are visible and

well-defined. The number of equipment failures and the current state of the equipment for use are reported in this reporting system, allowing senior management to approve plans and alert contractors for execution in order to meet long-term objectives.[13]

Contractors should Form work, according to the research findings, in order to attract workers' participation and monitor the proper implementation of technical and health protection regulations in the workplace, as well as prevent accidents and diseases, as part of the Committee for Technical Protection and Occupational Health's launch index. The contracting companies in the Water and Sewerage Organization have not taken this step, and the organization's HSE unit has not put pressure on the contractor to do so; however, in the gas organization, because the formation of the committee in the HSE checklist is required prior to the conclusion of the contract with the contractors, the contractors have a duty to form this committee, and the organization's HSE representative is present at every meeting. Failure to convene the meeting, as well as failure to address the deficiencies identified in that meeting for the next meeting, will cause the organization's HSE unit to delay payment of contractor fees; thus, the field observation revealed that this committee was formed in the gas organization and met on a regular basis. According to the findings of Mahmoudi et al. (2016) research, when employers publish the schedule of protection committee meetings for the year, inspectors from the employer's HSE unit arrange and attend the meeting or get the committee minutes to study and adapt to prior minutes. Take action, and if the issues raised at earlier sessions are resolved, they will approve and archive the document. The establishment of such a group may help projects apply HSE indicators more effectively.[8]

The research findings revealed that the employer company's continuous and significant attention and monitoring has been a key factor and effective tool in the development and prevention of deviation of contractors and subsidiaries; however, contracting companies in the Water and Sewerage Organization are rarely reviewed by the organization's HSE unit; however, the emphasis on payment management in the gas organization has been a key factor and effective tool in the development and prevention of deviation of contractors and subsidiaries; The findings of Wu et al. (2015) study show that the criteria for following up on deficiencies identified in the employer's HSE evaluation reports, as well as the implementation of audits in the safety management system and management monitoring and review programs, are introduced as factors influencing contractor performance.[14]

Conclusion

Finally, based on the foregoing, it can be concluded that the development and implementation of the requirements of the health, safety, and environmental management system in the contracting companies of the Gas Organization is superior to that of the South Khorasan Province's Water and Sewerage Organization. Its proper status can be attributed to factors such as the employer company's constant and intensive attention and monitoring, the emphasis on payment management, and the quantitative and qualitative estimation of human resources required for each project in the gas organization versus the water and wastewater company.

Conflict of interest

There is no conflict of interest among the authors.

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Authors Contribution

All the authors have accepted the responsibility for the entire content of this submitted manuscript and approved submission.

References

1. Asase M, Yanful EK, Mensah M, Stanford J, Amponsah S. Comparison of municipal solid waste management systems in Canada and Ghana: A case study of the cities of London, Ontario, and Kumasi, Ghana. Waste management. 2009; 29(10), 2779-2786.
2. Barnes P. The offshore petroleum industry in Atlantic Canada-a regional overview. In *Offshore Technology Conference*. OnePetro; 2008.
3. Fouladifard R. Effect of Drilling Cutting Discharge on Marine Environment and Benthic Foraminifera. Human & Environment. 2013 ;11(26), 19-26.
4. Gholamnia R, Barzegar M. Determine the relationship between the effective factors in preventing accidents by using structural equation modeling of steel industry. *Occupational Hygiene and Health Promotion*; 2019.
5. Harris F, McCaffer R, Baldwin A, Edum-Fotwe F. Modern construction management. John Wiley & Sons; 2021.
6. Jafari MJ, Mapar M, Mansouri N. A New Method for Contractors HSE Ranking at the Pre-Contract Stage Based on Contract Level. Iran Occupational Health. 2013; 10(2), 65-78.
7. Knode T, Cook P. Evaluation Of Contractor HSE Performance Based On Lagging Indicators: Is There A Better Way?. In *SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production*. OnePetro; 2004.
8. Mahmoudi S, Nassiri P, Mohammadfam I. Representation a framwork for contractors selection via of health, safety and environment. *Journal of Occupational Hygiene Engineering*. 2016; 3(3), 9-15.
9. Naseri A, Sepehri M, Mahmoudi S. Strategic performance evaluation of Health, Safety and Environment (HSE) based on Balanced Scorecard (BSC), the case study of a corporation in energy industry. Iran Occupational Health. 2014 ; 11(1), 79-94.
10. Nassiri P, Yarahmadi R, Hamidi A, Mirkazemi R. Assessment of contractors' HSE performance based on key indicators in a petrochemical industrial setting: a case study. Iran Occupational Health. 2014; 11(3), 59-70.
11. Norušis MJ. SPSS/PC+ studentware plus for business. SPSS Incorporated; 1991.
12. Poursoleiman MS, Kazemimoghadam V, Derakhshanjazari M. The effect of Health, Safety and Environment Management System (HSE-MS) on the improvement of safety performance indices in Urea and Ammonia Kermanshah Petrochemical Company. Health and Safety at Work. 2015; 5(3), 75-84.
13. Shafaeigholami P, Nasiri P, Yarahmadi R, Hamidi A, Mirkazemi R. Investigating the HSE performance of contractors based on key indicators in the petrochemical industry (case study). Iran Occupational Health. 2014 ;11(3):59–70.
14. Wu X, Liu Q, Zhang L, Skibniewski, MJ, Wang Y. Prospective safety performance evaluation on construction sites. Accident Analysis & Prevention. 2015; 78, 58-72.
15. Yarahmadi P, Dashti S, Sabzghabaei GR. Assessment and ranking of contractors from the point of view HSE performance using Multi-criteria decision making method (AHP and TOPSIS) in Imam Khomeini port complex. *Journal of occupational hygiene engineering*. 2018; 4(4), 70-80.
16. Yiu NS, Chan DW, Shan M, Sze NN. Implementation of safety management system in managing construction projects: Benefits and obstacles. Safety science. 2019; 117, 23-32.