

Comparative study between the QHSE Performance Management Systems of a sample of National and Foreign Oil Companies

Étude comparative entre les systèmes de gestion de la performance QHSE d'un échantillon de sociétés pétrolières nationales et étrangères

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Abstract: The aim of this article is to carry out a comparative study of the performance of Health, Safety and Environment Quality Management Systems on a sample of thirteen Algerian oil companies using the "case study" methodology. The main results of the study concluded on the one hand a positive proportional relationship between the maturity of QHSE systems and their performance; on the other hand, satisfactory performances in the areas of quality management and health and safety have been observed, but counter performances are however recorded in the area of environmental management in the majority of the oil companies studied.

Keywords: Performance, Management systems, QHSE, Maturity, Oil companies.

JEL Codes : L71, L71, L71.

Résumé : L'objet de cet article est de réaliser une étude comparative de la performance des Systèmes de Management Qualité, Hygiène-Sécurité et Environnement d'un échantillon de treize sociétés pétrolières algériennes en utilisant la méthodologie de « l'étude de cas ». Les principaux résultats de l'étude ont conclu d'une part, une relation proportionnelle positive entre la maturité des systèmes QHSE et leur performance ; d'autres part, des performances satisfaisantes dans les domaines du management de la qualité et de l'hygiène- sécurité ont été constatés, mais des contres performances sont toutefois enregistrés dans le domaine du management environnemental dans la majorité des entreprises pétrolières étudiées

Mots-clés : Performance, Systèmes de management, QHSE, Maturité, Sociétés pétrolières.

Codes JEL : L71, L71, L71.

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Introduction

To improve QHSE performance, companies have set up management systems according to international standards. Even if there is till now, no standards integrating the three fields within a unified repository, many international standards related to QHSE management systems have been established, as it is the case for the pioneer standard ISO 9001 for quality management (QMS), ISO 14001 for environmental management (EMS) and OSHAS 18001 which is replaced by ISO 45001 for occupational health and safety management system (OHSM).

The number of QHSE certified companies is growing in the world and Algerian oil companies are following this tendency by setting up QHSE management systems. From this perspective, we ask the following questions: After introducing management systems, have Algerian oil companies succeeded to achieve the expected goals in QHSE field? Are there performance differences between the three systems?

This objective of general scope shall in turn, satisfy operational and complementary objectives. This issue is clarified through answers given to such questions:

1. Are Algerian oil companies QHSE management systems efficient?
2. Are performances of the three QHSE management systems similar in Algerian oil companies?
3. What are the factors that may hinder management systems efficiency?

In order to fully understand the problem, we have formulated the following hypothesis:

1. The performance of QHSE management systems is closely linked to their maturity.
2. The quality management system is the most efficient of the three as it is directly linked to companies' customers.
3. The lack of staff involvement in implementing QHSE management systems is the main obstacle to the efficiency of these systems.

To answer the asked questions and validate the developed hypothesis, we have first, described the methods and techniques used in the study. Secondly, we have presented and discussed the findings of the study. Finally, we have evaluated the developed hypothesis.

1.-Material and methods

In order to properly identify the research questions and to test the validity of the developed hypothesis, we have opted for an empirical approach based on case study which started with interviews. Therefore, a questionnaire was distributed to the QHSE directors and managers of the thirteen big foreign and national oil companies governed by Algerian law. We have attempted to measure the performance of management systems by using a set of QHSE result performance indicators common to the QHSE management chart of companies under study. To do this, we calculated the performance rates of their systems using "the score method".

The axes that will be evaluated are the following:

- Axis 1: The quality management system (QMS);
- Axis 2: The environmental management system (EMS);

- Axis 3: The occupational health and safety management system (OHSM) or (CMS);
- Axis 4: Overall QHSE performance which is the arithmetic average of the previous axes performances.

The assessment and marking of performance rates of each axis according to the scoring method will be as follows:

- Excellent performance (04 points);
- Good performance: most objectives are achieved (03 points);
- Satisfactory performance(02 points) ;
- Incompatible performance and results(01 points);
- Poor overall performance (00 points).

The rating in question is assigned by the QHSE manager and approved by us after consultation of certain indicators from the QHSE management chart of the companies under study over the period of implementation of these systems. It is worthy to note that QHSE indicators differ from one company to another depending on their strategy, policy and objectives. In this regard, we have chosen QHSE result indicators common to the companies under study, referring to the QHSE management charts presented in table (01).

Table 1. Performance indicators used to assess QHSE performance management systems of oil companies under study

Performance nature	Measurement indicators
Quality	<ul style="list-style-type: none"> - % of satisfied and very satisfied clients - % of loyal clients - % of compliant products and services - % of achieved objectives in terms of quality according to the company's policy
Health- safety	<ul style="list-style-type: none"> - Number of fatalities - The overall accident severity rate (the number of lost days with disruption of work for one thousand worked hours. - Accident frequency rate (relationship between the accident number with disruption and length of working time). - % of health and safety achieved objectives in the year. - Achievement of health and safety objectives according to the company's policy. - The level of regulatory compliance in the field of health and safety (number of identified deviations during audits).
Environment	<ul style="list-style-type: none"> - % of drinking water consumption reduction. - % of electricity consumption reduction.

	<ul style="list-style-type: none"> - Volume of sorted waste. - Volume of recycled waste. - Volume of air emissions - Achievement of environmental objectives according to the company's policy. <p>The level of regulatory compliance in the field of environment (number of identified deviations during audits).</p>
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Source: Gillet-Goinard, 2006, p168.

Once the scores were assigned, we have calculated the percentage scores (which represent arithmetic averages) for each system element separately, in order to compare and draw conclusions about the missing fields in oil companies to be able to explain the performance gaps.

To explain possible performance gaps in the three QHSE areas, we have presented a set of proposals to the managers of the companies interviewed according to the management system audit questionnaires actually used in internal audits and companies certification audits.

To assess QHSE management systems maturity of the companies under study, we have used the Afnor FDX50-276-2005 standard. This assessment will allow us on one hand, to establish the potential relationship between the management systems maturity, and on the other hand to perceive the internal characteristics of the companies' management systems.

In this regard, the management system maturity is not assessed with regard to its setting time, but to a set of internal characteristics or standards primarily used in assessing maturity of quality management systems process, then extended to QHSE systems.

The Afnor FDX50-276-2005 standard is therefore, regarded as a system maturity assessment grid based on a set of criteria such as : QHSE process formalization level, characteristics of company monitoring, availability or non-availability of formalized management chart, existence or non-existence of workers know-how capitalization system, implementation or non-implementation of a company risk assessment, formalization level and improvement plans follow up (Afnor FDX50-276, 2005). This assessment leads to the company's QHSE system classification in a category of " five levels of maturity" which increase as the company's system maturity is growing up. Such levels are as follows: the first level is known as "basic operation", the second level is called "defined", the third level is said to be "mastered", the fourth level is called "optimized", the fifth and the last is called "continuous improvement".

2.-Results and discussion

Enter your results in this section, summarize the collected data and the analysis performed on those data relevant to the discourse that is to follow. After presenting the results, you are in a position to evaluate and interpret their implications, especially with respect to your original hypotheses.

The findings presentation will follow the same methodological structure and techniques as those adopted in the previous section.

2.1.-Presentation of the sample companies and characteristics of QHSE management systems

The study is conducted on a sample of thirteen national and foreign petroleum companies, under Algerian law, operating in oil exploitation from upstream to downstream (refining, production, pipeline transport and distribution), throughout the country, but mainly in Hassi Messaoud because the majority of such companies are located in the industrial zone of this region. More than 90% of them are big companies, in particular as oil industry is a capital-intensive industry where Sonatrach companies, its subsidiaries and big multinational firms are present. Some of them wished to remain anonymous with regard to certain questions, particularly those relating to their QHSE performance systems.

The sampling companies may be divided according to their activities nature:

-Oil production and refining: SONATRACH-Production Department - Hassi Messaoud; SONATRACH-Production Department HASSI RMEL and SONATRACH- Production Department HAOU D BARKA OUI Ouargla.

-Pipeline transport: SONATRACH- Pipeline Transport par Canalisations Haoud El Hamra area, Hassi-Messaoud and SONATRACH- Pipeline Transport Bejaia area.

-Distribution and marketing of petroleum products: NAFTAL Company.

-Petroleum services: Entreprise Nationale des Services aux Puits, Entreprise Nationale des Travaux aux Puits, WEATHERFORD, HALLIBURTON, EGYPTIAN ENGINEERING AND CHEMICALS.

-Oil research and exploration: Entreprise Nationale de Geophysique.

According to the study data, Algerian oil companies have two management system types. On one hand, Sonatrach companies in the field of production, refining and transport have their own management system called HSE-Management System. Such system is not concerned with international management standards certification but include all standards requirements like ISO 14001, ISO 45001, some ISO 9001 principles, as well as the best European oil industries practices. On the other hand, Sonatrach subcontracting companies specialized in petroleum services have QHSE integrated management systems with the three certifications.

2.2.- QHSE performance systems of oil companies under study: Counter-performance is recorded in the environmental field

For confidentiality purposes, we kept the names of companies under study anonymous. First of all, we will present rates of subcontracting companies then, those of Sonatrach companies.

2.2.1.- QHSE system performance rates of QHSE certified subcontracting oil companies

For confidentiality purposes, the subcontracting companies will be referred to as: A, B, C, D, E, F, G and H. The table represents performance summary levels per axis and per company, as well as the overall performance of each of them. Such results are obtained by the score method following the grid which is explained in the previous section.

Table 2. QHSE system performance rates of subcontracting companies**Unit: Percentage**

<u>Assessed axis</u>	Axis 1	Axis 2	Axis 3	Axis 4
Company	QMS	EMS	CMS	QHSE overall performance
A	75%	50%	75%	67%
B	75%	50%	75%	67%
C	25%	25%	25%	25%
D	50%	50%	50%	42%
E	75%	50%	50%	58%
F	75%	75%	75%	67%
G	75%	75%	75%	67%
H	75%	75%	75%	58%
Axis performance	66%	41%	63%	56%

Source: Prepared by us after processing the survey data.

From the table 2, we found that:

- 75% of oil companies under study have an above-average overall performance (between 58% and 67%).
- A notable weakness in performance level is recorded on axis 2 "Environmental management" for almost 38% of diagnosed companies;
- A higher performance level on axis 1 "Quality management" in comparison with the other axes (66% for quality against 63% and 41% respectively for health/safety and environment);

We conclude that subcontracting companies' management systems "shortcomings" are identified in the area of environmental management.

Furthermore, through deep analysis of such results, we deduced that foreign companies are more efficient than national companies in the environmental field, as illustrated in table (03).

Table 3. QHSE subcontracting companies Performance rate according to the company's nationality**Unit: percentage**

Performance per axis and company's nature	Foreign	National
Axis 1: QMS	67%	65%
Axis 2: EMS	33%	45%
Axis 3: CMS	67%	60%

Source: Prepared by us after processing survey data.

The "QMS" and "CMS" performance rates are higher in foreign companies, thing which reflects the optimal control of the functioning of the two systems by such companies.

As regards the environmental axis, foreign companies have recorded low performance rates despite of their know-how and the maturity level of their system, mainly when they are still unable to achieve their main environmental objectives in Algeria. In this perspective, it may raise the following question: are there any external obstacles that may impede success of such systems.

2.2.2.- HSE-MS rates performance of Sonatrach group companies

For confidential purposes, "instructing party" will be referred to as: I, J, K, L and M. the following table will present a summary of the performance per axis and company, as well as the overall performance of each company. However, the performance rate "QMS" axis has not been calculated due the lack of such system in Sonatrach Group Companies.

Table 4. HSE-MS performance rate of Sonatrach Group Companies

Unit: percentage

Axes	I	J	K	L	M	Performance rate
Axis 2: EMS	25%	50%	50%	50%	50%	45%
Axis 3: CMS	50 %	75%	75%	75%	75%	70%
HSE- MS overall performance	38%	63%	63%	63%	63%	58%

Source: Prepared by us after processing survey data.

From the results of the table 4, we note:

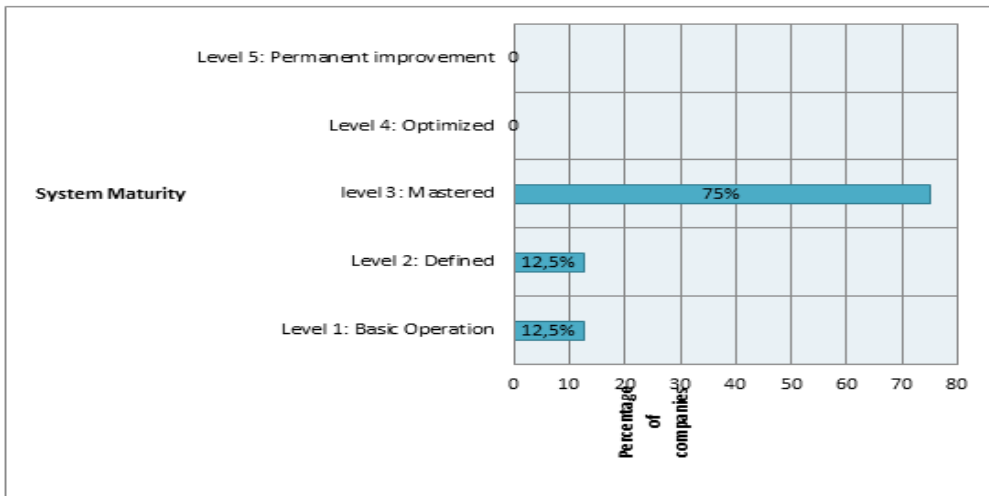
- 80% of Sonatrach companies under study have an overall performance above the average (more than 63%);
- A notable weakness in performance level, recorded on axis 2 "Environmental management" with an overall performance equal to 45% for all companies.

Thus, we note that performance levels are fairly similar between QHSE management systems which are under certification and Sonatrach group HSE-MS even if the quality dimension is not included in such system. However findings related to QHSE performance reveal that whatever the company's management system type, the oil companies' environmental performance will remain insufficient.

2.3.- Proportional relationship between companies' QHSE maturity systems and their performance

QHSE maturity levels were assessed QHSE managers of national and foreign oil companies according to the "process evaluation grid" within Afnor FDX50-276-2005.

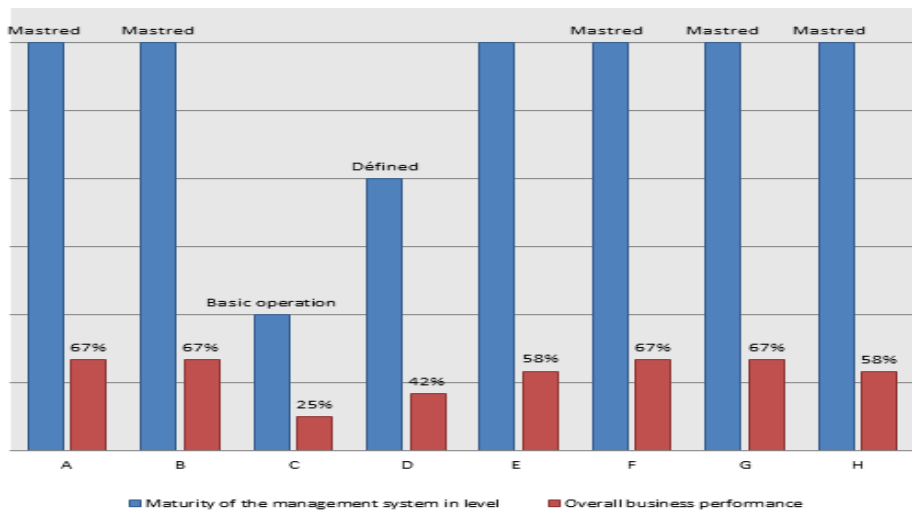
Figure.1. Maturity levels of companies under study



Source: Prepared by us after processing survey data.

The figure (01) shows the maturity levels which are achieved by integrated systems adopted by the certified companies. According to such findings, 75% of companies believe that their systems are controlled (level 3 of the evaluation grid). Therefore, it would be more interesting to look at each company separately to see if there is a link between systems maturity level and their performance rate.

Figure.2. Relationship between QHSE systems maturity levels and their performance



Source: Prepared by us after processing the survey data.

The results in figure (02) are showing a close relationship between QHSE systems performance of companies under study and their maturity levels. As soon as the company's system is controlled, QHSE performance increases with performance rates exceeding 50%.

In this way, companies having succeeded in "controlling their systems" as processes, are those constantly, involving their selves in improving their processes (processes implementation, definition of relevant management chart and indicators, risks management and development of monitoring and evaluating skills, etc.) to meet permanently the interested parties requirements. Control stages ensure that products and activities comply with the interested parties' requirements. Non-conformities are thus, rarer and remedial actions are taken within the processes.

Furthermore, companies which have "defined" their systems are those having identified and mobilized the necessary resources to operate according to well-defined objectives.

On the other hand, companies which are still at "the basic operation" stage have recorded QHSE non-conformities with regard to such systems even if the process definition corresponds to the interested parties' needs. Such level is characterized by instability of implementation process because of the wrong definition of QHSE procedures and performance system monitoring indicators, as well as the absence of formal risk identification and insufficient capitalization of individuals' know-how etc.

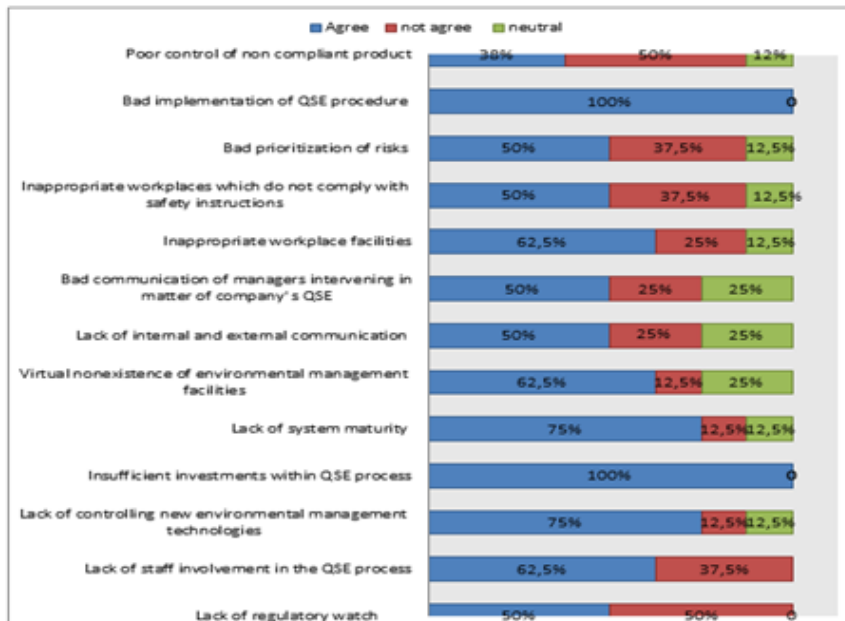
2.4.- Internal and external factors causing QHSE performance gaps in oil companies

First, we attempt to explain certified companies QHSE performance gaps, then those of SONATRACH companies as regards HSE- MS systems.

2.4.1.- Explanation of subcontracting companies SM-QHSE performance gaps

Figure (03) demonstrates the main causes of certified companies' performance gaps according to companies QHSE managers.

Figure.3. Explanation of subcontracting companies' performance gaps



Source: Prepared by us after processing survey data.

The gaps presented in figure (03) may be analyzed by area or globally:

- The whole system: 100% of companies consider that the performance gaps are due to insufficient investments within QHSE process and bad implementation of QSE procedure, that is to say human responsibility and its lack of involvement are the main factors of such gaps estimated at 62.5% of surveyed companies. Furthermore, 50% of surveyed companies reveal that gaps are resulting from inadequate communication within the company and 75% consider that they are due to the lack of maturity system. However, the absence of a regulatory watch is shared between 50% of companies that agree and 50% that do not agree, given that this element is required under environmental safety standards.

- Regarding quality: 50% of surveyed companies did not agree that poor control of non-compliant product is the main cause of gaps. These answers imply that such companies control their non-compliant products.

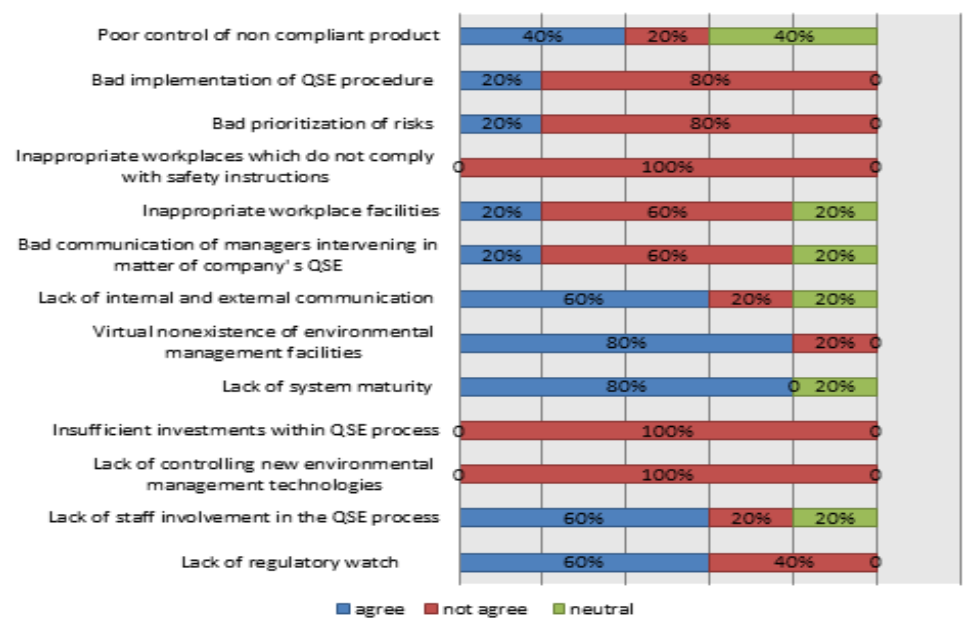
- Regarding health/safety: although not unanimous, 50% of companies believe that poor prioritization of risks and inappropriate workplaces could be causing performance gaps.

- Regarding environment: Internal and external reasons are the main cause of gaps. As regards internal reasons, 75% of companies think that gaps are due to poor control of environmental management new technologies and 62% consider that that they are resulting from inappropriate workplace facilities and risk management. However, 62.5% believe that such gaps are in connection with external reasons because of the lack of environmental management facilities such as hazardous waste treatment centers in Algeria.

2.4.2.- Explanation of HSE-MS performance gaps of Sonatrach companies

Figure (04) presents the main causes of HSE-MS systems performance gaps.

Figure 4. Explanation of HSE-MS systems performance gaps.



Source: Prepared by us after processing survey data.

According to figure (04) results, we note that SONATRACH companies' gaps source is different from the source of subcontractors' gaps:

- The whole system: 80% of companies consider that gaps are due to the lack of maturity system. 60% of companies explain such phenomenon by the absence of a regulatory watch (higher percentage compared to the subcontractors). 100 % of companies do not agree that insufficient HSE investment and lack of controlling of new technologies are the origin of such gaps (thing which explains the important financial package allocated by SONATRACH to this field). It is also, worthy to note that the lack of staff involvement and internal communication are causing gaps (60% of the surveyed companies).
- Regarding health/safety: 80% do not agree that the bad prioritization of risks and inappropriate workplaces (100%) are the origin of performance gaps. Such answers reflect and confirm the good performance of companies in the field of occupational health and safety.
- Regarding environment: internal and external reasons are the main cause of gaps. As regards internal reasons, only 20 % of companies think that gaps are linked to inappropriate work places and risk management. As for workplaces, the interviewed managers consider that SONATRACH had inherited heavy facilities from the past that necessitate long time for back fitting.

Conclusion

Despite the similarities that may exist between the different management systems of oil companies under study, mainly they refer to the same international QHSE standards or HSE-MS reference framework of SONATRACH group, the question related to "how" implementing such systems differs from one company to another one according to its objectives, culture, interested parties requirements and its own environmental aspects that are in connection with its activities, dangers and risks incurred by its employees. Therefore, performance systems differ from one company to another one.

From this study, we have obtained the following results:

- The QHSE-MS performance is related to a determinant factor which is called "maturity system". The more the system is mature; the better is performance because the company in question will better controlling its process. Thing which confirms the first hypothesis.
- If we assess the three QHSE systems separately, we note that the quality management system is the most efficient of them because it is directly related to client. Therefore, it ensures the company's sustainability. Thing which confirms the second hypothesis.
- The CMS is the least efficient one. In this context we conclude that Algerian oil companies QHSE management systems shortcomings are related to environmental management.
- Such system performance gaps are due to internal and external factors. The internal factors are related to the lack of staff involvement and systems maturity. The external factors are linked to Algeria's environmental strategy (laws are in advance with company's reality); as well as to the lack of companies supporting infrastructures, poor control and awareness for environmental protection. It is worthy to note that in spite of the existence of ecological taxation, the rate of environmental taxes collection remains partial, according to the Environment Directorate of Ouargla.

This last conclusion does not confirm the last hypothesis which considers that the lack of staff involvement in the process of setting up QHSE management systems is the main obstacle to the efficiency of such systems.

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