

The Possibility of Applying the Requirements of Quality Management Systems in the Oil and Gas Industry According to ISO 29001: 2020: A Case Study(Midland Refineries Company - Dora Refinery)

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Keywords: Oil and Gas Quality Management System; ISO 29001:2020, Midland Refineries Company, Dora Refinery.

Abstract: The current research aims to determine the possibility of applying the oil and gas quality management system ISO 29001: 2020 in the Middle Refineries Company / Al-Dora Refinery in Baghdad to measure the size of the gap, discover strengths and weaknesses and address weaknesses, as well as directing the attention of officials in the researched organization to the importance of applying a management system Oil and gas quality and its role in improving performance. The research in the weakness of the upper management's knowledge of what the researched standard is and what benefits it will accrue to the liquidator when it is approved, and the case study approach was adopted to reach the research objectives through the checklist as a main tool for data collection while relying on a number of statistical tools for analysis. The research results show that there is a relatively large gap between the actual reality and the requirements of ISO 29001:2020, as well as the company's lack of techniques to analyze and address risks and opportunities.

1 INTRODUCTION

The world today is witnessing an expansion and acceleration in the use of innovative technical solutions to perform various production operations. Risk-intensive industries, including the oil and gas industries, face significant challenges, requiring organizations to adopt robust tools and mechanisms to ensure product quality and operational safety, as well as achieve continuity of performance. In this context, specialized international standards have emerged as a standard tool used to facilitate and standardize practices, improve efficiency, and enhance stakeholder confidence. In general, the importance of adopting ISO 29001:2020 in the oil and gas sector is more evident than ever before, as this industry is currently facing a challenge that places it at a crossroads, represented by increasing pressure to transform energy production and simultaneously reduce carbon emissions, all amidst geopolitical fluctuations [1].

In general, environmental regulations emphasize adherence to market quotas and refining ratios in oil facilities. This poses a challenge to organizations with the increasing cost of concealment, such as disruption

to supply chains or the disruption and destabilization of market confidence among investors and stakeholders, in addition to the legal and financial consequences of environmental disasters [2]. Therefore, an organization's possession of a structured framework that balances quality management, risk management, operational safety, and ensuring continuity is a must, not a secondary consideration. ISO 29001:2020 is distinguished by its adoption of the principles of ISO 29001 alone but also extends to adding specialized standards that address the complex challenges of supply chains in the hydrocarbon industry. This is demonstrated by the specification's emphasis on the need to integrate technical requirements for materials and equipment, reduce process variations across value chains, and promote a culture of zero defects and proactive accident prevention. In addition, the standard requires senior leaders to adopt a risk-based thinking model, aligning quality policies with the organization's strategic direction and promoting accountability at every functional level [3].

Digital transformation has become a significant contributor to the generation of large amounts of operational data, such as from IoT devices, sensor

systems, and predictive analytics. ISO 29001:2020 provides an effective framework for transforming this massive data into meaningful decisions that facilitate improved reliability and efficiency and reduce the costs of poor quality. In the context of sustainable development, implementing this standard enhances compliance efforts with environmental, social, and governance (ESG) disclosure initiatives, enhancing transparency and contributing to gaining the trust of financial markets and international partners. On this basis, the adoption of this specification by one of the Iraqi refineries, namely the Dora refinery, represents an important strategic step towards establishing solid operational systems capable of responding quickly to risks, as well as meeting the expectations of stakeholders and thus achieving a competitive advantage based on operational excellence and sustainability at the same time [4]. Some challenges and risks have emerged in organizations operating in the oil extraction and refining, gas, and petrochemicals sector, which necessitated the application of the international standard ISO 29001:2020 by these organizations to ensure continuous improvement, reduce defects and waste, as well as changes in the supply chain from service providers. This standard is of great importance in improving production process performance and achieving a competitive advantage for the organization [5].

Internationally, American Petroleum Institute reports confirm that refineries and companies operating in the oil and gas sector that have implemented ISO 29001 have seen a clear decline in manufacturing defect rates of approximately 27% during the first three years of the specification's adoption. Additionally, the company has seen a significant decrease in damaged downtime and poor-quality losses. These indicators reflect the system's ability to adopt continuous improvement models and principles, along with a risk analysis methodology across supply chains. This explains the increasing appetite of companies and institutions for adopting these specifications in their most sensitive operations. Assessing the feasibility of implementing these specifications at the Dora refinery not only contributes to meeting cleaning compliance requirements but also provides strategic opportunities to reduce operational waste and enhance the confidence of partners and regulatory authorities. This aligns with the Iraqi Ministry of Oil's vision to enhance competitiveness and sustainability in the refining sector [5], [6]. The research problem was represented in the senior management's lack of knowledge about the nature of the standard in

question and the benefits it would bring to the refinery when adopted, measuring the gap in implementing clause (4) on organizational context, (5) on leadership, of the international standard ISO 29001:2020, and coming up with some conclusions and recommendations. The case study approach was adopted through a checklist based on the international standard ISO 29001:2020. To cover the research topic, it was divided into (study methodology, theoretical aspect, practical aspect, conclusions and recommendations). The most prominent conclusions were that the refinery management did not adopt a policy specific to ISO 29001:2020. The main recommendations included formulating a policy for the oil and gas quality management system ISO 29001:2020 published and understood inside and outside the company, as the refinery management should integrate the policy for ISO 29001:2020 with the policy for ISO 9001:2015 due to the great similarity between the two standards.

2 METHODOLOGY

Due to the importance of the oil and the Ministry of Oil's urging oil organizations to obtain global quality management system certificates, the Midland Refineries Company/Daura Refinery was selected. Repeated initial visits to the company made it clear that it needs to implement the oil and gas quality management system according to ISO 29001:2020 because it directly affects its work. It then identifies strengths to enhance them and weaknesses to reduce them. The research problem lies in the senior management's lack of knowledge about the nature of the standard in question and its benefits to the refinery when adopted. Accordingly, the problem can be formulated by raising the following questions:

- 1) What is the possibility of the researched company applying the standard for the oil and gas quality management system ISO 29001:2020?
- 2) What is the size of the gap between the actual reality of the company and clauses (4) and (5) of ISO 29001:2020 at Daura Refinery?

The study was important in raising the interest of the researched refinery in the positive aspects of implementing the oil and gas quality management system and providing the foundations on which it can rely to achieve its goals. In light of the problem and questions raised, the main objective of the study was to diagnose the reality of implementing clause (4) organizational context, clause (5) leadership, of ISO

29001:2020 to determine the amount of gap between the requirements implemented in the Daura refinery and the standard specifications. The case study approach was adopted to achieve the study objectives of determining the size of the gap between the company’s actual reality and the requirements of ISO 29001:2020 in the researched company, as well as using multiple tools in data collection represented by personal interviews with stakeholders and officials and using a checklist to collect data and reach scientific facts. The triple scale was used in the practical aspect, as shown in Table 1, to determine the degree of conformity with the international standard [5].

Table 1: The triple scale determines the degree of conformity with the international standard.

Fully implement, fully document	Partially implement, partially document	Not implement, not document
2	1	0

The possibility of applying an integrated model of project management systems according to ISO21502,10006:2017 specifications using the DMAIC methodology / A case study in the Engineering Construction Department / Residential Complex Project for SOMO Oil Company, Master’s Thesis, Administrative Technical College / Baghdad, Iraq.

3 RELATED WORKS

Over the past decade, research on management-system standards in the oil-and-gas (O & G) sector has moved well beyond tick-box certification and toward questions of tangible performance, risk reduction, and sustainability. Early empirical work by Al-Harthy et al. showed that when ISO 9001 is implemented in upstream drilling companies, it correlates strongly with improvements in both operational efficiency and HSE indicators; structural-equation modeling revealed that almost half of the variance in performance could be explained by the quality-management practices embedded in the standard [7]. Complementing the quality lens, Pakhomova and colleagues analyzed the 2015 revision of ISO 14001 and argued that its new emphases on life-cycle thinking and risk management provide Russian O & G firms with a ready-made roadmap for green innovation and for aligning with

“best available technology” requirements in national law [8]. At the system level, a comprehensive review of Integrated Management Systems (IMS) in offshore operations confirmed that most organizations converge on a triple-standard core-ISO 9001, ISO 14001, and OHSAS 18001-yet recent studies are beginning to prioritize sustainability, social responsibility, and enterprise risk rather than mere compliance [9]. The literature is also widening to cover information security and climate governance. Working with Iraq’s national Oil Exploration Company, Mohammed & Jasim integrated ISO 27001 and the new ISO 10013 guidance on documented information, exposing a 36 % implementation gap and demonstrating how security controls can be hard-wired into traditional quality documentation systems [10]. On the decarbonization front, Ribeiro et al. synthesized standardization and benchmark initiatives across ISO TC 301 and ISO 50001, illustrating-through cases from ADNOC, Pertamina, and Saudi Aramco-how structured energy-management systems translate directly into multi-million-dollar savings and six-figure annual CO₂ reductions. Their review also highlights the bridging role of industry bodies such as IPIECA and IOGP in turning generic standards into sector-specific implementation guides [11]. Standards are equally being used as analytical frameworks in risk-intensive contexts. Sinsabvarodom et al. applied ISO 19906 formulas within a Monte-Carlo simulation and showed that positive correlation among ice parameters can inflate design ice loads on Arctic structures by up to 60 %, underscoring the need for probabilistic rather than deterministic design envelopes [12]. In marine protection, Sepp Neves et al. adopted ISO 31000’s risk-management cycle to build an ensemble-modeling approach for oil-spill scenario analysis; the Lebanon 2006 case study demonstrated how the framework can replace opaque “risk tolerance levels” with transparent spatial risk maps for emergency planners [13].

Finally, standard-driven thinking is beginning to filter into environmental assessment practice. A systematic quality audit of 19 Nigerian O & G Environmental Impact Statements found that nearly half were unsatisfactory [14]. Taken together, these studies paint a picture of an industry that is progressively using ISO and related frameworks not only to certify but to learn: integrating multiple disciplines, quantifying benefits, and extending the standards’ language into areas as diverse as cybersecurity, Arctic engineering, and climate strategy.

Table 2: Checklist for item four (context of the organization).

T	Requirements of the specification 4-Context of the organization	Fully implemented fully documented	Partially implemented, partially documented	Not Implemented not document
41.	Understanding the organization and its context			
a	There is a clear definition by the management of the oil semi-refinery of the internal issues related to the purpose of the company.		✓	
b	The oil refinery management works to identify external matters and issues related to the purpose of the refinery and the nature of its activities.		✓	
c	The oil refinery management reviews all information related to internal and external issues affecting the refinery.			✓
42.	Understanding the needs and expectations of stakeholders			
1	The refinery management, concerning the needs and expectations of stakeholders, does the following:			
a	The management of the oil refinery company works to identify the stakeholders and their needs.		✓	
b	The oil refinery management determines the requirements of the stakeholders.		✓	
c	The oil refinery management determines the needs and expectations this refinery can meet for stakeholders through.			✓
43.	Determining the scope of the oil and gas quality management system			
4.3.1.	The refinery management determines the boundaries and applicability of the oil and gas quality management system to define its scope of application. Therefore, it identifies:			
a	Internal and external matters falling under Section 4.1 relating to understanding the company and its business context			✓
b	The terms and requirements referred to in Clause 4.2 relate to understanding the needs and expectations of the important parties.		✓	
c	Identifying the refinery's products and services	✓		
d	In an oil refinery, an oil and gas quality management system is available, maintained periodically, and presented in the form of documented information.			✓
e	The scope specifies the types of goods and services covered by the ISO 29001:2020 system.			✓
4.4	Oil and Gas Quality Management System and its Processes			
4.4.1.	The refinery management, in accordance with the requirements of the specification (ISO 29001:2020), does the following:			
a	In the oil refinery, a comprehensive quality management system is effectively established, implemented, maintained, and improved.			✓
b	All required processes and how they interact with each other are identified in an oil refinery.			✓
c	In the oil refinery, the necessary resources required for operation are determined, and their availability is ensured on a regular basis.	✓		
d	In the oil refinery, all necessary procedures are applied to ensure the efficient operation of all operations.			✓
e	In the oil refinery, continuous improvement and development processes are applied in accordance with the oil and gas quality management system.			✓
4.4.2.	The refinery management ensures the following:			
a	In the oil refinery, the necessary maintenance operations are carried out, and all documented information is updated to support operations.			✓
b	In the oil refinery, documented information retention processes are implemented in order to ensure that various operations are carried out according to plan.			✓
Iterations		2	5	11
Result		4	5	0
Execution rate		0.5		
Percentage match		%25		
Gap size		%75		

4 IMPLEMENTATION ASSESSMENT OF ISO 29001:2020

This section evaluates the implementation of the ISO 29001:2020 oil and gas quality management system at the Midland Refineries Company (Doura Refinery). The assessment was conducted using a checklist, personal interviews, and direct observations to determine the level of conformity with the standard requirements. A three-point scale was used to verify and evaluate the required information.

4.1 First: The Reality of Applying Context of the Organization

The checklist in Table 2 shows the level of actual application and documentation of the requirements of Item Four (Context of the Organization) by applying and documenting the oil and gas quality management system according to the specification (ISO 29001:2020) in the Midland Refineries Company (Doura Refinery). The company achieved a weighted arithmetic mean of (0.5) out of (2) points. For this axis, with a conformity rate of (25%), which indicates a gap of (75%).

4.1.1 Strengths

At an oil refinery, senior management demonstrates a clear, explicit, and proven ability to differentiate the products and services offered by the refinery as an integral part of the organization's daily operations. While this type of differentiation is often conducted routinely and based on routine processes, it is not based on clear, prior strategic planning that links outputs to overall quality objectives. Nevertheless, senior management's behavior in this context clearly demonstrates a deep understanding of the nature of products and the important role they play in the value chain. Management periodically reviews the needs of production units to ensure equipment readiness and the availability of technical personnel. This clearly reflects a commitment to ensuring all the elements necessary for institutional success, although this sometimes requires quantitative performance indicators that help measure the efficiency of these resources and the degree of their optimal investment.

4.1.2 Weaknesses

One of the points noted about the refinery is that it has not implemented an oil and gas quality management system in accordance with ISO 29001:2020 despite having previously adopted ISO 9001:2015. This weakness may be attributed to senior management's limited awareness of the importance of the specialized version of these specifications. This has resulted in a lack of training and qualification programs, and consequently, employees lack the necessary skills to implement this system. The failure to adopt the new specifications results in a clear failure to meet the requirements of stakeholders, whether regulatory bodies, customers, or suppliers. In general, senior management at the refinery lacks systematic tools and methods that enable it to measure and evaluate the efficiency of production processes and the quality of outputs in light of international standards and specifications. This is also due to the limited support of senior leadership for measurement and analysis initiatives, which reduces opportunities for continuous improvement and leads to a weak ability to detect, address, and correct shortcomings early.

4.2 Second: The Reality of Implementing the Fifth Clause (Leadership)

The assessment, based on the checklist in Table 3, showed that the overall level of actual implementation and documentation of the leadership requirements within the ISO 29001:2020 framework remains noticeably limited at the Midland Refineries Company - Dora Refinery, where the leadership axis recorded a weighted arithmetic mean of 0.26 out of 2. This means that the conformity rate does not exceed 13%, revealing an actual gap estimated at approximately 87%. This result naturally indicates that the leadership roles, responsibilities, and powers, including adopting a clear quality policy, allocating resources, and promoting a culture of risk-based thinking, have not been implemented in a manner consistent with the approved framework. This, in turn, calls for a strategic intervention to restructure the governance system and activate the practice of leadership that supports the system.

Table 3: Checklist of the fifth clause (leadership).

T	Requirements of the Standard Leadership	Fully implemented, fully documented	Partially implemented, partially documented	Not implemented, not document
51.	Leadership and Commitment			
l	The top management of the refinery demonstrates its commitment to the continuous improvement of the oil and gas quality management system through:			
a	The scope and boundaries of the oil and gas quality management system are defined.			✓
b	The policy and objectives of the oil and gas quality management system are defined and ensured.			✓
c	The requirements of the oil and gas quality management system are integrated with various operations.			✓
d	All plans for operating and implementing the oil refinery are approved.		✓	
e	The necessary resources are provided for the oil and gas quality management system in the oil refinery.			✓
f	Awareness campaigns are conducted for oil refinery employees regarding the importance of ensuring the oil and gas quality management system is aligned with the necessary requirements and activities.			✓
g	The oil and gas quality management system achieves the desired and expected results in the oil refinery.			✓
h	The various processes involved in the continuous improvement of the oil and gas quality management system in the refinery are encouraged.			✓
i	Contributing to the effectiveness of the oil and Gas quality management system by individuals.			✓
j	The effective contribution of individuals to all oil and gas quality management system activities is ensured. at all levels within the refinery.	✓		
5.12.	Customer focus			
a	Customer and beneficiary requirements comply with all legal and regulatory requirements.			✓
b	Various potential risks and opportunities are identified that may, in one way or another, impact the conformity of products and services.		✓	
c	In an oil refinery, emphasis is placed on ensuring customer satisfaction.		✓	
52.	Oil and gas quality management system policy			
5.21.	The senior management sets the oil and gas quality management policy according to the following:			
a	Senior management policies at the oil refinery are appropriate and consistent with the oil and gas quality system.			✓
b	A practical framework is provided for setting and periodically reviewing the objectives of the oil and gas management system.			✓
c	At the oil refinery, senior management is committed to meeting the legal, regulatory, and approved requirements.			✓
d	Senior management is committed to continuously improving the performance of the oil and gas quality management system.			✓
5.22.	Publish oil and gas quality management system policy.			
l	The refinery's senior management ensures that the oil and gas quality policy is:			
a	Senior management at Source Oil ensures that the oil and gas quality management system complies with ISO 29001:2020.			✓
b	Senior management ensures a focus on customer service across all aspects of the oil refinery.			✓
c	Senior management ensures that the integrity of the oil and gas quality management system is maintained.			✓

Table 3 (continued): Checklist of the Fifth Clause (Leadership).

53.	Organizational roles, responsibilities, and powers		
a	Senior management ensures that the responsibilities and authorities associated with the various roles are defined, distributed, and understood.		✓
b	Senior management ensures that all operations comply with the Oil and Gas Quality Management System (OGMS) according to ISO 29001:2020.		✓
c	Senior management continuously encourages and ensures a focus on customer service quality across all refinery facilities.	✓	
d	Senior management ensures that the integrity of the OGMS is maintained during the planning, modification, and implementation phases of operations.		✓
e	Senior management ensures that all operations within the organization achieve the desired results and are consistent with the OGMS.		✓
f	Senior management ensures the preparation of reports identifying improvement opportunities in accordance with the OGMS.		✓
Duplicates		2	3
The result		4	3
Implementation rate		0.26	
Matching Percentage		%13	
Gap size		%87	

4.2.1 Strengths

The refinery management monitors positive effects and attempts to enhance them, as well as monitors negative effects and tries to establish mechanisms to address them. The refinery management conducts simplified, non-systematic analytical procedures to identify sources of risk and work to reduce them, as well as identify possible opportunities.

4.2.2 Weaknesses

The refinery management lacks appropriate methods and techniques to identify risks and opportunities that may be encountered during production. Failure to set objectives and goals for the ISO 29001:2020 oil and gas quality management system in the refinery. Based on the above, it is clear that there is a gap between the actual reality of clauses (4) and (5) and the ISO 29001:2020 oil and gas quality management system. The results can be summarized in Table 4.

Table 4: Average of iso 29001:2020 specification clauses.

Gap size	Percentage	Execution rate Matching	Requirements
%75	%25	0.5	Organization context
%87	%13	0.26	Leadership
%90	%10	0.21	Planning
%84	%16	0.32	the total

5 CONCLUSIONS

The study shows that applying ISO 29001:2020 goes beyond technical compliance and requires a comprehensive transformation in organizational culture, leadership, and operational practices. The current gap between actual practices and the standard's requirements reflects weaknesses in strategic planning, risk management, and institutional coordination. Limited awareness of the standard, lack of a unified quality policy, and insufficient integration between departments reduce the effectiveness of quality management and hinder continuous improvement. Strengthening alignment between quality, safety, and operational performance is therefore essential to achieving sustainable efficiency and competitiveness.

The study recommends clearly defining the scope of ISO 29001:2020 implementation and establishing a formal quality policy aligned with organizational goals. It is essential to appoint a qualified representative and form a specialized team responsible for planning, monitoring, and continuous improvement. Enhancing awareness through structured training programs, adopting systematic risk management practices, and integrating modern digital tools will strengthen performance and compliance. Additionally, aligning quality objectives with operational and strategic priorities will support sustainable development and improve overall organizational effectiveness.

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