



Improving Safety and Performance through Leadership and Management Practices in Petroleum Field (Baiji Oil Refinery), Iraq

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Article information

Article history:

Received 23 February, 2026
Revised 25 May, 2026
Accepted 11 June, 2026

Keywords:

Total Recordable Incident Rate,
Lost Time Injury Rate Safety performance,
Leadership,
Management practices.

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Abstract

The oil and gas industry is a hazardous sector associated with flammable materials, high-pressure processes, and complex operational scenarios. Improving safety and performance at the Baiji Petroleum Field (North Refineries Company) requires bridging the gap between high safety knowledge and lower safe behavior through active leadership. Key interventions include strengthening management commitment, enhancing safety training, implementing rigorous hazard identification, and upgrading technology to reduce worker exposure to risks. Oil is the backbone of Iraq's economy and the country's survival, but oil fields also pose serious safety and performance challenges. The Effect of Leadership and Management Practices on Safety Performance: A case Study of the Baiji Petroleum Fields/ Iraq. A case study approach was used, employing Safety Performance Indicators such as Total Recordable Incident Rate (TRIR) and Lost Time Injury Rate (LTIR), along with structured questionnaires, interviews, and field observations conducted between 2020 and 2024. The results demonstrate that due to this improvement in safety, the rates of incidents decreased drastically after the participation of senior leadership team members, communication process improvement on incident prevention, and safety management organization in an organised manner. It is concluded that leadership-oriented safety mechanisms are needed to enhance the safety performance and operational stability of Iraqi petroleum field operations.

DOI :<https://doi.org/10.69513/jnog.v2.i2.a2> ©Authors, 2026, College of Engineering, Alnoor University.

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1. Introduction

Oil & gas industry remains one of the riskiest sectors of the world (due to extreme operational dangers, high financial volatility, and significant environmental impacts (1). Key risks include catastrophic fires, explosions, worker fatalities, and toxic exposure (2). These workers are exposed to many hazards in the oil and gas industry, that include the risks associated to drilling, refining, transportation, and maintenance work in petroleum fields, and the high numbers of workers suffer serious injuries resulting as a common occurrence of

serious accidents that have a great impact on business time to go up and down (3) .

Iraq's economy is built on petroleum fields. Due to its infrastructure and operational capacity, the Baiji petroleum field in Salah Al-Din Governorate is strategically important. But safety performance has been compromised by years of hostilities, dilapidated facilities, a variety of workers, and a variety of contractors. The safety method that was based only on protocols and protective gear became insufficient without strong leadership and management commitment. Management practices and leadership behavior have significant impact on

worker behavior, safety culture and performance outcomes according to recent research (Zohar, 2023) (4). This study examines how management and leadership styles influence performance and safety in the Baiji Petroleum Field.

2. Research Problem

Despite safety regulations and technical controls, workplace incidents, near misses, and unsafe practices continue to occur in the Baiji petroleum field. Most of these problems stem from poor safety communication, inconsistent enforcement, and low leadership visibility. Operational risks rise and safety management systems become less effective due to the absence of a leadership-driven safety culture.

3. Research Objectives

- To investigate how management and leadership techniques can enhance safety performance at Baiji Petroleum Field.
- To evaluate safety performance using TRIR and LTIR indicators.
- To identify leadership and management gaps affecting safety outcomes.

4. Literature Review

It has been repeated over and over again that the most important factor related to safety performance is leadership level within high-risk industries. Transformational leadership can strengthen employee motivation, safety involvement, and proactivity (5). Even if transactional leadership promotes compliance with rules, it is less successful when no employee is involved (6).

Lower accident rate and improved safety indicators are highly related with management dedication and leadership visibility in the petroleum sector (7). Research suggests organizations with high safety leadership have significantly lower TRIR and LTIR values(8) . A positive safety culture largely depends on management techniques such as: incident investigation, communication, hazard identification and safety training (9). The further impact of organizational and cultural variables on safety outcomes in Middle Eastern settings demands locally tailored leadership approaches (10). However, this article adds to the dearth of empirical research on Iraqi petroleum fields.

5. Methodology

This research adopts a case study methodology focusing on Baiji petroleum field. A mixed-method approach was used, combining quantitative and qualitative data. **Data collection and analysis methods included:**

- Safety incident records (2020–2024)
- Total work-hour logs (employees and contractors)
- TRIR and LTIR calculations
- Structured questionnaires
- Interviews with management and HSE personnel

Quantitative data were analyzed using descriptive statistics and trend analysis, while qualitative data were analyzed thematically.

5.1 Safety Performance Indicators

$$TRIR = \left(\frac{\text{Total Recordable Incidents}}{\text{Total Work Hours}} \right) \times 200,000$$

$$LTIR = \left(\frac{\text{Lost Time Injuries}}{\text{Total Work Hours}} \right) \times 200,000$$

These indicators are internationally accepted for evaluating safety performance in petroleum operations (11).

6. Results and Analysis

6.1 Safety Performance Trends

Table 1. Safety Performance Indicators at Baiji Petroleum Field (2020–2024).

Year	Work Hours	Recordable Incidents	TRIR	Lost Time Injuries	LTIR
2020	210,000	7	6.67	3	2.86
2021	225,000	6	5.33	2	1.78
2022	242,000	5	4.13	2	1.65
2023	250,000	5	4.00	2	1.60
2024	260,000	4	3.08	1	0.77

TRIR declined by 54% and LTIR by 73% across the study period, which showed great safety improvement.

6.2 Leadership Practices and Safety Outcomes

Table 2. Leadership Practices and Observed Safety Effects

Practice	Observation	Impact
Site walk-throughs	Increased	Reduced unsafe acts
Safety meetings	Regular	Improved awareness
Incident investigations	Management-led	Better root cause analysis
Open communication	Encouraged	Higher reporting

6.3 Worker Safety Behavior

Table 3. Safety Behavior Indicators

Indicator	2020	2024
PPE compliance	72%	91%
Near-miss reporting	Low	High
Safety communication satisfaction	2.8/5	4.2/5

6.4 Comparative Analysis

Table 4. Safety Performance Before and After Leadership Enhancement

Period	Avg. TRIR	Avg. LTIR
2020–2021	6.00	2.32
2022–2024	3.74	1.34

The results confirm a strong association between leadership involvement and improved safety performance.

7. Discussion

The findings support the direct correlation between leadership behavior and the performance and safety culture outcomes. Safety meetings conducted by management, enhanced leaders visibility and transparent communication instilled trust and accountability in employees. This validation of earlier research indicating that there was the greatest influence when it comes to the impact of leaders on safety performance (12)(Guldenmund, 2024). When management initiated a safety program in Baiji petroleum industry.

In Baiji petroleum industry, when management-initiated safety initiatives, it led to reduction in contractor coordination and workforce diversity issues. Improved safety performance was also related to operational stability, as it prevented downtime and incident-related disruptions.

8. Conclusion

This study found that leadership and management strategies have a major role in enhancing performance and safety on petroleum field operations and are critical for fostering a positive safety culture, reducing incidents, and improving operational performance. Performance of leadership-controlled safety systems is shown by significant reductions in TRIR and LTIR. The findings can be relevant towards the Iraqi petroleum enterprises who wish to make sustained safety enhancements in the future.

9. Recommendations

To cultivate a robust safety culture, institutions should enhance the engagement of leadership in regular safety activities while implementing ongoing initiatives for the development of safety leadership. Also, they must promote candid and

Acknowledgement

The author would like to express sincere appreciation to the Editor-in-Chief and the anonymous reviewers for their valuable comments, constructive feedback, and insightful suggestions, which significantly improved the quality and clarity of this manuscript. The time and effort devoted by

the editorial team in managing the review process are highly appreciated.

The author is grateful to the journal for providing the opportunity to publish this research and for its commitment to advancing knowledge in the field of safety and engineering management open conversations regarding safety issues and actively support the reporting of potential hazards and near-miss incidents. Furthermore, consistently assess safety performance metrics and include safety objectives in operational planning.

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تحسين السلامة و الأداء من خلال ممارسات القيادة و الإدارة في مصفى بيجي للنفط، العراق

يعتبر قطاع النفط و الغاز من الصناعات الأكثر خطورة نظرا لوجود مواد قابلة للاشتعال، و عمليات الضغط العالي ، و سيناريوهات التشغيل المعقدة. يتطلب تحسين السلامة و الأداء في حقل بيجي للبتروك سد الفجوة بين المعرفة العالية بالسلامة و السلوك الامن المنخفض من خلال القيادة الفعالة. و تشمل التدخلات الرئيسية تعزيز التزام الإدارة، و تحسين التدريب على السلامة، و تنفيذ تحقيق دقيق للمخاطر، و تحديث التكنولوجيا للحد من تعرض العمال للمخاطر. يعتمد العراق على احتياطاته النفطية من اجل بقاء اقتصاد البلاد، لكن حقول النفط تشكل أيضا مشاكل كبيرة تتعلق بالسلامة و الأداء. في هذا البحث تم إجراء دراسة حالة باستخدام مؤشرات أداء السلامة، والتي تشمل معدل الحوادث المسجلة الإجمالي (TRIR) ومعدل الإصابات التي تؤدي الى الانقطاع عن العمل (LTIR) وذلك من خلال استبيانات منظمة ومقابلات وملاحظات ميدانية أجريت بين عامي (2020-2024) أظهرت النتائج انخفاضاً ملحوظاً في معدلات الحوادث نتيجة لتحسن السلامة، وذلك من خلال مشاركة الإدارة العليا، وتحسين عملية التواصل بشأن منع الحوادث، وتنظيم إدارة السلامة بشكل فعال. وخلصت الدراسة إلى ضرورة وجود آليات سلامة موجهة من قبل القيادة لتعزيز أداء السلامة والاستقرار التشغيلي لعمليات حقول النفط العراقية.