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Theme

Measuring the Performance of the Health and Safety Management System Case of DP RNS

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DEDICATIONS

DEDICATION

This dissertation is dedicated to the many individuals who have contributed to my journey of growth and learning, making me the person I am today.

To myself, for the determination, resilience and countless hours of hard work that have been poured into this academic endeavor. This journey has been a testament to my perseverance and commitment to excellence.

To my parents, whose unwavering support, encouragement and sacrifices were the foundation of my education.

To all the companions of my childhood and youth whose friendship and shared experiences have enriched my life and contributed to my all-round development.

To the teachers who imparted invaluable knowledge, wisdom and life lessons throughout my academic journey.

To every person who has met me and left an indelible mark on my academic and personal development, I express my profound gratitude.

At the end Alhamdulillah for everything

DEDICATIONS

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To all those whom Allah the Almighty has honored with mention and gratitude in His Holy Book

{وَوَصَّيۡنَا ٱلۡإِنسَٰنَ بِوَٰلِدَيۡهِ حَمَلَتۡهُ أُمُّهُۥ وَهۡنًا عَلَىٰ وَهۡنٖ وَفِصَٰلُهُۥ فِي عَامَيۡنِ أَنِ ٱشۡكُرۡ لِي وَلِوَٰلِدَيۡكَ إِلَيَّ ٱلۡمَصِيرُ}

14: Luqman

To my parents, may Allah bless them with good remembrance in this world and the hereafter

{ وَمِنۡ ءَايَٰتِهِۦٓ أَنۡ خَلَقَ لَكُم مِّنۡ أَنفُسِكُمۡ أَزۡوَٰجٗا لِّتَسۡكُنُوٓاْ إِلَيۡهَا وَجَعَلَ بَيۡنَكُم مَّوَدَّةٗ وَرَحۡمَةً إِنَّ فِي ذَٰلِكَ لَأٓيَٰتٖ لِّقَوۡمٖ يَتَفَكَّرُونَ}

21: Ar-Rum

To my dear wife

{ قَالَ سَنَشُدُّ عَضُدَكَ بِأَخِيكَ}

35: Al-Qasas

To my dear brothers and sister

{ قَالَ مَا خَطۡبُكُمَاۖ قَالَتَا لَا نَسۡقِي حَتَّىٰ يُصۡدِرَ ٱلرِّعَآءُۖ وَأَبُونَا شَيۡخٞ كَبِيرٞ}

23: Al-Qasas

To my daughters, may Allah make them among the righteous

{ قَالَ لَهُۥ مُوسَىٰ هَلۡ أَتَّبِعُكَ عَلَىٰٓ أَن تُعَلِّمَنِ مِمَّا عُلِّمۡتَ رُشۡدٗا}

66: Al-Kahf

To all those who taught and guided us

{وَقُل رَّبِّ أَدۡخِلۡنِي مُدۡخَلَ صِدۡقٖ وَأَخۡرِجۡنِي مُخۡرَجَ صِدۡقٖ وَٱجۡعَل لِّي مِن لَّدُنكَ سُلۡطَٰنٗا نَّصِيرٗا}

80: Al-Isra

To my minister, ABDELHAKIM BENZINA , may Allah grant him success

{ إِذۡ يَقُولُ لِصَٰحِبِهِۦ لَا تَحۡزَنۡ إِنَّ ٱللَّهَ مَعَنَاۖ }

40: At-Tawba

And to all friends and loved ones.

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ACKNOWLEDGEMENT

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HSE : Health, Safety and Environnent [Santé, Sécurité et Environnement]

OSHA : Occupational Health and Safety Administration

PSM : Process Safety Management

ISO : International Organization for Standardization

HSE-MS : Health, Safety and Environnen Management System

PPE : Personal Protective Equipment

OHSMS : Occupational Health and Safety Management Systems

GENERAL INTRODUCTION

This scholarly thesis is dedicated to the comprehensive exploration of various strategies employed in the management of industrial risks and their practical implementation within Sonatrach, which is known as Algeria's state-owned enterprise in the oil and gas sector. The ensuing chapters extensively delve into the intricate nuances and multifaceted dimensions involved in comprehending and addressing risks within the industrial domain, placing a specific emphasis on the critical areas of process safety management and the ongoing quest for continuous enhancement. Through a meticulous analysis encompassing crucial definitions, existing regulatory frameworks, as well as pertinent real-life illustrations, the primary objective is to furnish invaluable perspectives that shed light on the indispensable role played by effective risk management in ensuring the well-being of employees, the preservation of the environment, and the overall welfare of the neighboring communities

Chapter I: The chapter explains the significance of understanding and handling industrial risks, defining terms like "risk" and "hazard." It introduces safety management systems, major accident consequences, and key terms. Also, it defines Safety Management Systems, their role in employee well-being, and major accidents with historical events. The chapter presents Sonatrach, Algeria's oil company, and its Health, Safety, and Environment Management System, and discusses occupational safety and management systems.

Chapter II: This chapter discusses Process Safety Management (PSM) intricacies, highlighting its importance in industrial risk management. It distinguishes PSM from workplace safety management, outlines its four pillars, and emphasizes leadership, safety culture, and compliance with regulations. It also addresses topics like learning from experience, managing risks, and competence in process safety.

Chapter III: Shifting focus to practical risk management in industrial operations, this chapter covers nine elements for continuous improvement. It details requirements for operating procedures, safety during work, integrity of installations, external company management, training, change management, and emergency procedures to ensure safe operations and improvement.

CHAPTER 01 : Understanding Industrial Risks and Risk Management Strategies

1 Understanding Industrial Risks and Risk Management Strategies

1.1 Introduction

This chapter will provide an overview of the importance of understanding and managing industrial risks, including definitions of key terms such as "risk" and "hazard." It will also introduce the concept of safety management systems and the potential consequences of major industrial accidents.

1.2 definition of key terms

1.2.1 risk

Risk is the likelihood of harm or loss resulting from exposure to a hazard, encompassing both the probability of the harmful event occurring and the severity of its consequences.

1.2.2 Hazard

A hazard is any potential source of harm or adverse effect on people, property, or the environment. Hazards can be physical (such as hazardous chemicals), environmental (such as extreme weather conditions), technological (such as unsafe equipment), or behavioral (such as risky actions).

1.2.3 Performance

Measurement of the quality or usefulness of work products and work activities of the PSM program .

1.2.4 Control measures

Control measures are actions, processes, or devices implemented to minimize or eliminate risks associated with hazards. They can be categorized into engineering controls, administrative controls, and personal protective equipment (PPE). Control measures aim to reduce the likelihood of an incident occurring or to mitigate the severity of its consequences.

1.2.5 Safety barriers

Safety barriers are specific types of control measures that act as obstacles to prevent accidents or reduce their impact. They can be physical barriers (such as

guardrails or containment walls), procedural barriers (such as safety protocols and emergency procedures), or technological barriers (such as alarm systems and automatic shut-off devices).

1.3 Definition of Safety Management System

A safety management system is designed to achieve objectives and requires monitoring for progress. The system includes assessments leading to adjustments in action plans, known as "controlling". BS OHSAS 18001:2007 defines it as part of an organization's management framework addressing OSH hazards. It involves organization, activities, duties, protocols, practices, processes, and provisions, overseeing security effectively. Implementing the system has implications for organizations, requiring adherence to regulations for personnel well-being. SMS is a voluntary strategy to prevent OSH issues and ensure harmony with management approaches, with benefits like reduced accidents and illnesses, worker protection,

intervention in hazardous situations, promoting good hygiene practices, enhancing working conditions and personnel motivation.

1.4 Major Accidents

1.4.1 Definitions Accident

An accident can be described as an unplanned event or actionthatresults in undesired consequences, e.g., injury, ill health, damage totheenvironment, damage to or loss of property, plant and materials. [2]

1.4.2 Major Industrial Accidents

Major industrial accidents are unforeseen incidents that occur in industrial environments and result in serious repercussions on both people and the environment. For example, in the explosion incident at
the BP refinery in 2005, which led to the death of 15 people and the injury of 180 others, organizational factors were the main cause.

Table 1-1：Major Historical Events Worldwide

Date	Location	Type of Accident	Fatalities and Damages
1966	Feyzin-France	Fire in a petrochemical storage industry	18 deaths
1974	Flixborough-Great Britain	Explosion on an industrial site	28 deaths
1976	Seveso-Italy	Leak of dioxin from a chemical plant	37,000 people affected
1984	Bhopal-India	Leak of a toxic gas	2,500 deaths and 250,000 injured
1984	Mexico-Mexico	Explosion of an LPG tank	More than 500 deaths and 7,000 injured
1986	Chernobyl-Ukraine	Explosion of a nuclear power plant	More than 15,000 deaths
2001	Toulouse-France	Explosion of an industrial site	30 deaths and more than 2,000 injured

Sonatrach operates in the oil and gas sector, which is highly hazardous and prone to accidents. Among these accidents are

Table 1-2：Striking Technological Accidents - SONATRACH

Type of Accident	Date	Location
Gas explosion incident	**January 2013**	**Sonatrach refinery in Bouarfa**
Gas leakage incident	**January 2013**	**In Amenas gas field**
Fire incident	**August 2018**	**Sonatrach gas facility in Skikda**

1.5 Company Overview

RHOURDE-NOUSS is situated in the Wilaya d'ILLIZI, located 350 km southeast of OUARGLA, 1200 km southeast of ALGER, and 270 km southeast of HASSI MESSAOUD. The first discovery of gas in RHOURDE-NOUSS dates back to 1956, with the first well RN1 drilled in 1962 revealing the presence of rich gas in condensate in several reservoirs. RHOURDE-NOUSS covers several fields within a 100 km radius from the regional headquarters located in the RHOURDE-NOUSS center field. The facility at RHOURDE-NOUSS treats a composition of gases containing components such as CO2, N2, CH4, C2H6, C3H8, i-C4H10, n-C4H10, i-C5H12, n-C5H12, C6H14, and C7, with a water content of 4 ppm. The

products treated and produced include Gas deethanizer effluent, GPL (Liquefied Petroleum Gas), crude oil, and condensate. The gas deethanizer effluent is condensed and processed through various stages to separate the components effectively.

1.6 Introduction of the Company's HSE-MS (Health, Safety, and Environment Management System)

Sonatrach, Algeria's state-owned oil and gas company, places a high priority on health, safety, and environmental (HSE) management within its operations. The

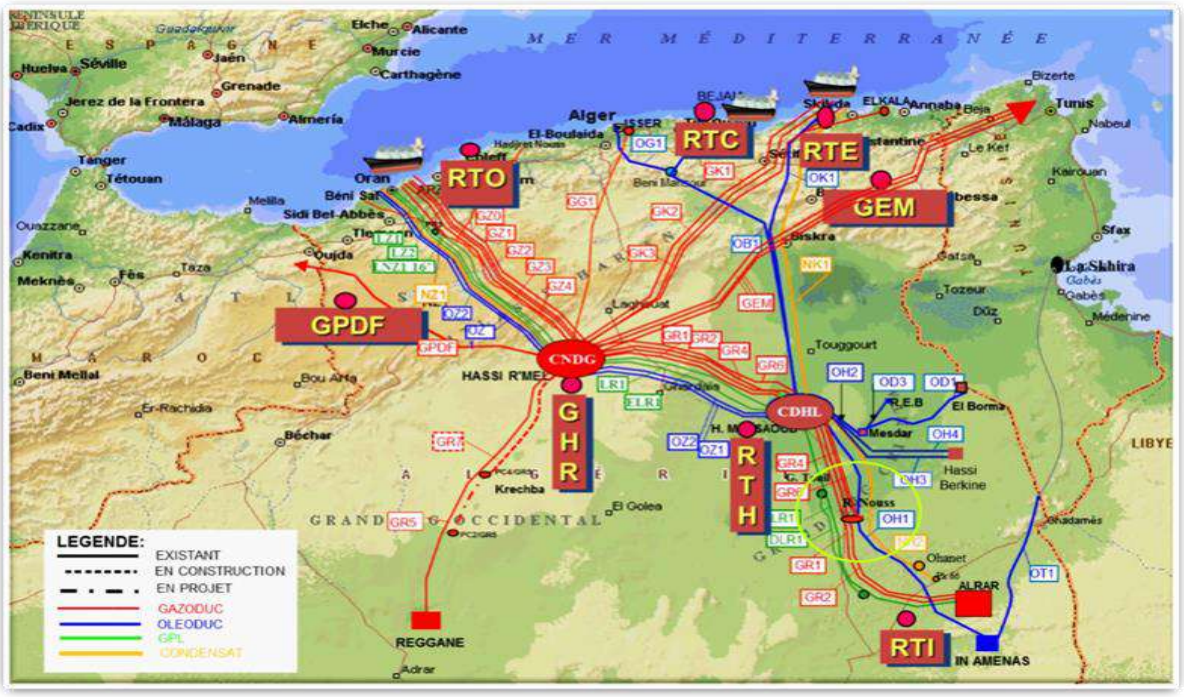

Figure 1-1：Location of the region RHOURDE-NOUSS

company recognizes that effective HSE management is critical not only for the well-being of its employees but also for the protection of the environment and surrounding communities.

Sonatrach's HSE-MS, or Health, Safety, and Environment Management System, is a comprehensive framework designed to ensure that all aspects of health, safety, and environmental protection are integrated

into its operations. The HSE-MS is aligned with international standards and best practices to provide a systematic approach to identifying, assessing, and mitigating risks associated with its activities.

Key components of Sonatrach's HSE-MS include:

1. Policy and Commitment: Sonatrach has established clear HSE policies and objectives, demonstrating its commitment to maintaining high standards of health, safety, and environmental protection.
2. Risk Assessment and Management: The company conducts regular risk assessments to identify potential hazards and implements controls to minimize risks to employees, assets, and the environment.

3. Training and Competency: Sonatrach invests in training programs to ensure that its employees have the necessary skills and knowledge to perform their jobs safely and responsibly.
4. Emergency Preparedness and Response: The company has robust emergency response plans in place to effectively manage and mitigate any incidents that may occur during its operations.
5. Compliance and Continuous Improvement: Sonatrach is committed to complying with applicable laws, regulations, and industry standards related to health, safety, and environmental protection. The company also continuously monitors and evaluates its HSE performance to identify areas for improvement.
Overall, Sonatrach's HSE-MS reflects its dedication to responsible and sustainable operations, striving to protect the health and safety of its workforce and minimize its environmental footprint.

1.7 Occupational Safety and Management Systems

1.7.1 Description and General Structure

In recent years, importance of occupational health and safety management systems has increased significantly. This can be attributed to three main developments: activities of ISO, establishment of OHSA and improvement of VPPs, and announcement of savings from management systems. ILO stresses the need for employers and employees to manage risks leading to occupational diseases or accidents. Occupational Health and Safety Management Systems are seen as crucial for standard activities and proactive goals. Overall, occupational health and safety management system is a tool for harmonization and improvement of activities in an enterprise. While security and occupational health and safety management systems are similar, the latter focuses on preventing work accidents specifically.

1.7.2 Elements of a Sustainable Management System

Quality standards and occupational health and safety management systems should be implemented simultaneously to establish an effective management system.

The fundamental principle underlying all quality and management systems is the Deming cycle, which involves 4 main phases and highlights the necessary stages for their implementation.

An efficient management system consists of the following elements：

- Policy
- Planning
- Organization
- Participation and representation of the employees
- Communication
- Consultancy
- Application and operation
- Performance measurement
- Corrective and preventive actions
- Management review
- Continuous improvement [1]

1.7.3 Objectives of the Occupational Health and Safety Management System

- Prevention of Occupational Injuries: The main objective of the Occupational Health and Safety Management System (OHSMS) is to prevent workplace injuries, which are a significant global concern.

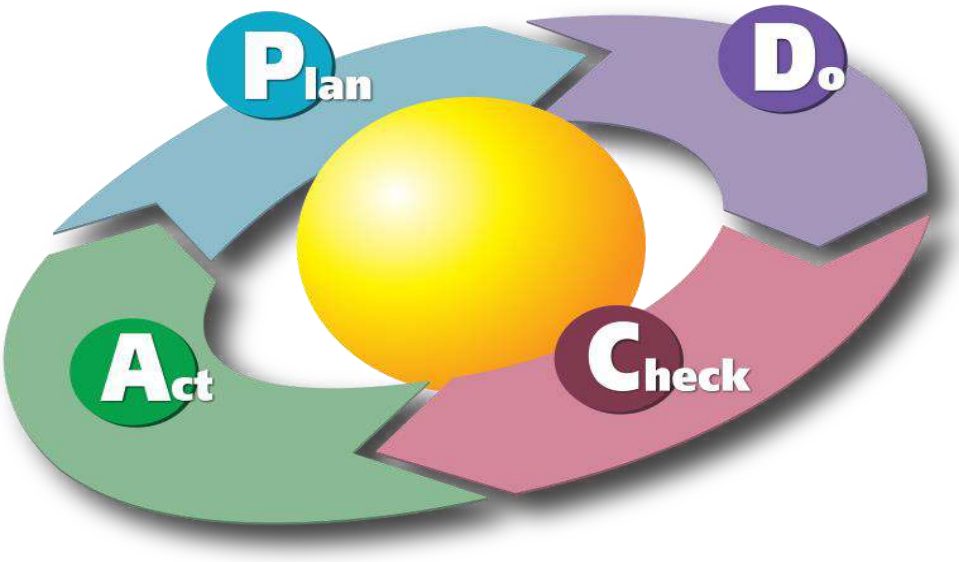

Figure 1-2：the PDCCA Cycle (Plan-Do-Check-Act)

- Enhancing Safety Climate: Implementing ISO 45001 and providing safety training can positively impact the safety climate within organizations, fostering a safer work environment.
- Improving Occupational Health and Safety Practices: Companies certified to ISO 45001 standards demonstrate better Occupational Health and Safety (OHS) practices compared to non-certified organizations, underscoring the importance of continuous improvement in safety measures.
- Documentation and Compliance: ISO 45001 implementation leads to improved documentation for OHS management and ensures compliance with

legal requirements, thereby enhancing the overall safety culture within the organization.

- Identifying Influencing Factors: Factors such as management commitment to safety, safety communication, employee involvement, and OHS training are pivotal in the effectiveness of OHSMS like ISO 45001, emphasizing the need for a comprehensive approach to occupational health and safety management.

1.7.4 Benefits of Occupational Health and Safety Systems

Occupational health and safety management systems facilitate the structured handling of occupational health and safety risks within enterprises by identifying and organizing processes and procedures. These systems ensure the execution, assessment, and sustainability of plans. The benefits of implementing such management systems for enterprises and organizations include a decline in workplace accidents,
enhanced productivity, reduced staff turnover and absenteeism, lowered insurance expenses, fostering a culture of health and safety, engaging employees in occupational health and safety practices, effective leadership in managing the process, ability to adhere to legal requirements, building a positive reputation for the enterprise, and ensuring employees feel secure.

1.8 Methodology

1.8.1 Methodology

In order to respond to this inquiry, a managerial contribution strategy founded on a compliance framework, which was selected based on the safety management system of processes (PSM), was chosen due to its alignment with the specific context and objectives being pursued. This approach leans towards the regulation of significant risks through an organized methodology. The overarching objective of our strategy is to establish a process safety management system built on the outcomes of a preliminary assessment, which involves conducting an audit to ensure compliance with PSM requirements within the company's HSE-MS management system, followed by the implementation of a detailed action plan.

1.8.2 Problem

In this context, it was deemed beneficial to establish a field of study focused on examining the role of managerial strategies in mitigating industrial risks. In order to achieve this, a pertinent query was posed and adapted to a particular setting that addresses our issue: "Do adherence to regulatory standards for managing significant risks and the array of initiatives initiated by SONATRACH guarantee adequate control over major industrial risks?"

1.9 Conclusion

this chapter has laid the foundation for understanding the complexities of industrial risks and the critical nature of effective risk management strategies. By exploring key definitions, company practices, and potential repercussions of accidents, we can

better appreciate the significance of implementing comprehensive safety management systems.

Chapter 02 : Process Safety Management System (PSM)

2 Process Safety Management System (PSM)

2.1 Introduction

Chapter 2 delves into the intricacies of Process Safety Management (PSM), a vital component of industrial risk management. PSM focuses on recognizing, understanding, and controlling process risks to prevent harm and incidents.

2.2 Process Safety Management System (PSM)

2.2.1 Definition

The PSM system involves the implementation of management systems to recognize, comprehend, and manage process risks in order to avoid harm and incidents associated with the process.

2.2.2 Difference between workplace safety and process safety management (PSM)

Process Safety Management is often confused with workplace safety management. However, these two systems are distinguished by the nature of the risks they aim to control.

- Process Safety Management aims to prevent major accidents such as explosions, tank fires, and other incidents.
- Workplace safety management aims to prevent accidents on the job, such as slips, trips, falls, falling objects, falls from height, and exposure to hazardous substances.

If you are responsible for safety and you are thinking about this type of hazards, you are probably dealing with "Process Safety

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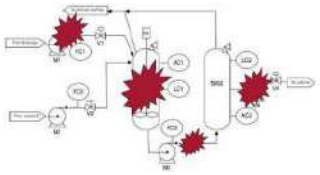

Figure 2-1：Difference between workplace safety and process safety

2.2.3 PSM Structure

The PSM system is based on four main pillars, namely:

1. Committing to process safety
2. Understanding hazards and risks
3. Managing and controlling risks
4. Learning from experience.

Engagement, strong leadership, and a safety culture play a vital role in ensuring excellence in process safety within an organization. It is imperative for employees to have a deep conviction that safety is not just a priority but a fundamental core value that is fully supported by the upper management. Such belief instills a sense of responsibility and commitment in individuals, making them more inclined to adhere to the best safety practices even when not directly supervised. The continuous reinforcement of this mindset across all levels of the company is of utmost importance to foster a culture where safety is ingrained in every aspect of operations.

Understanding dangers and risks is a critical component in the efficient allocation of resources aimed at managing risks associated with various processes. This understanding is gained through a thorough analysis of identified hazards and assessed risks, which serves as a foundation for making informed decisions on risk management strategies and initiatives.

Managing and controlling risks encompass a multidimensional approach involving various key aspects. Firstly, it involves the safe upkeep of hazardous processes to prevent any potential incidents. Secondly, it requires a systematic approach to managing changes within processes to ensure that risks are maintained at an acceptable level. Lastly, it involves thorough preparation for any unforeseen incidents, prompt response to mitigate their impact, and effective management of the aftermath to prevent reoccurrence.

Learning from experience is a continual process that involves the constant monitoring and utilization of a wide range of information sources, both internal and external. This includes the application of industry best practices, addressing any deficiencies highlighted through internal incidents, drawing insights from incidents in other organizations, and ultimately creating a culture that not only promotes but also

actively embodies the retention and application of lessons learned for continuous improvement and enhancement of safety protocols.

2.3 Engagement for process safety

This pillar is supported by five elements:

- Process safety culture
- Compliance with national regulations, standards and company guidelines
- Process safety competence
- Staff involvement and commitment
- Transparency with stakeholders

2.3.1 Culture of process safety

2.3.1.1 Definition

Process safety culture is the combination of values and behaviours of a group that determines how process safety is managed. It encompasses beliefs, attitudes and actions related to safety.

2.3.1.2 Minimum requirements of process safety culture

1. Clearly state the importance of process safety.
2. Ensure that process safety is as much of a priority at company and site level as other disciplines such as production.
3. Regularly emphasise the importance of safety at all levels of the company.
4. Demonstrate strong leadership by training managers on basic concepts of safety culture, enabling them to be visible, active and consistent with regard to company commitments and objectives.
5. Ensure that responsibility and accountability are defined at all levels.
6. Demonstrate managers' commitment and values through their communications, actions, priorities and resource allocation.
7. Establish and apply high standards of performance in safety.
8. Maintain constant alertness to dangers and their potential consequences, and be attentive to signs of weaknesses in the process safety management system.
9. Empower workers to successfully carry out their safety responsibilities.
10. Base process safety decisions on the advice of experts rather than their rank or position in the organisation.
11. Ensure open and effective communication via vertical and horizontal channels.
12. Ensure continuous improvement in process safety through appropriate and timely risk assessments, thorough incident investigations, and the sharing and implementation of lessons learned, both internally and from other companies worldwide.
13. Provide a rapid response to safety problems and concerns.
14. Ensure continuous performance monitoring through relevant and clear retrospective and predictive indicators.
15. Include explicit safety responsibilities in the missions of each manager, such as the frequency of meetings with employees.
16. Include attitudes, behaviours and performance in job descriptions at all levels, and address them in periodic performance reviews.
17. Involve all levels of the organisation in safety performance planning and evaluation.
18. Increase the frequency of communications during significant changes, after a major safety event, or following an audit that highlights significant discrepancies.
19. Conduct internal and external audits and periodic reviews.
20. Perform an annual review, including an examination of problems related to safety culture.
21. Investigate the root causes of safety problems and be attentive to weak signals related to culture that may contribute to poor performance.

2.3.2 Conformity to National Regulations, Standards, and Company References

2.3.2.1 Definition

Once the requirements have been identified, it is important to develop compliant procedures and practices. The acquisition of the necessary knowledge and appropriate resources is also essential.

2.3.2.2 Minimal Requirements for Compliance with National Regulations, Standards and Company Frameworks

(1). Document the compliance process in appropriate detail. Designate an entity or person to monitor regulations and standards.

(2). Define the scope of compliance.

(3). Implement a system for recording the compliance situation.

(4). Designate personnel to monitor compliance and address questions/problems of interpretation involving specific situations and regulatory discrepancies.

(5). Monitor compliance deadlines and any introduced modifications.

(6). Determine the applicability of standards to be adopted.

(7). Conduct periodic audits of this element to monitor performance.

(8). Provide access to the texts for all personnel.

(9). Compile regulatory texts, standards, and company frameworks governing process safety in a central location and inform personnel of its existence.

(10). Evaluate the applicability and impact of introduced modifications to regulatory texts, standards, and frameworks.

(11). Provide resources for maintaining compliance.

(12). Implement a system to ensure regular communication to the site director regarding the site's compliance situation.

(13). Develop a detailed written program addressing all regulatory obligations.

(14). Define all regulatory obligations regarding safety, as well as associated requirements for generally accepted good engineering practices (RAGAGEP) for each installation.

(15). Define the technical and regulatory competencies necessary for compliance.

(16). Establish a competent entity composed of experts in standards and regulations to manage all compliance-related issues.

(17). Provide initial and refresher training on relevant standards to those concerned with compliance.

(18). Establish key indicators, collected annually, to monitor performance in terms of compliance, and discuss and review them periodically.

(19). Monitor the evolution of standards, update related documentation, and communicate changes to affected persons.

2.3.3 Competence in Process Safety

2.3.3.1 Definition

The company must constantly improve its knowledge and skills in process safety.

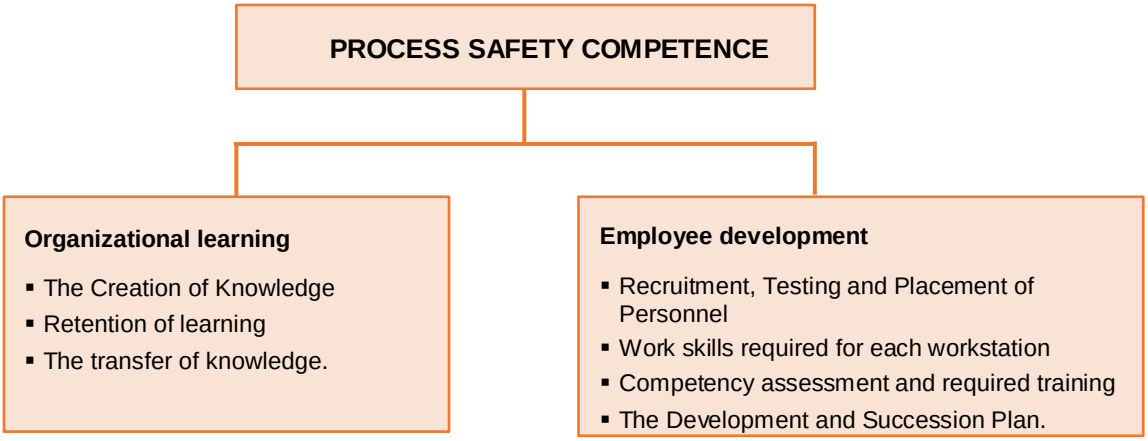

Figure 2-2 : PROCESS SAFETY COMPETENCE

2.3.3.2 Minimum Requirements for Process Safety Competence

a. Requirements Related to Organizational Learning

- Ensure that skills improvement is aligned with the company's strategic plan.
- Develop a set of objectives to maintain and improve skills, supported by actions that can ensure progress towards organisational objectives that promote skills.
- Assign responsibilities to consolidate efforts to maintain and improve skills.
- Create a technology manual that documents the history of the process and the essential knowledge to maintain skills.
- Document available information in a way that facilitates searches, quick localisation, maintenance and classification of technical information.
- Proactively transmit essential safety information to potentially concerned structures and key personnel.
- Organise periodic technical seminars on safety-related topics.
- Incorporate lessons learned from previous incidents into training and similar activities.
- Adjust plans and resources provided based on a periodic review with the site director and concerned parties.

b. Requirements Related to Competence Assessment and Individual Development

- Establish a competency management system that identifies the knowledge, skills and abilities required for each job.
- Periodically assess the aptitude of employees in relation to the requirements of their role and responsibilities.
- Ensure that the skills required in terms of process safety, job suitability, and health monitoring are defined for all roles in the company.
- Ensure that a system is in place for the screening, selection and placement of employees who meet the specified requirements for the jobs.
- Ensure that individual and collective knowledge and experience are maintained and taken into account when there is a change of personnel.
- Ensure that the design of roles and responsibilities is realistic, taking into account capacities and key human and organisational factors.

- Ensure that a development and succession plan is in place for all positions with process safety management responsibilities.
- Ensure that a periodic review of the continuity of critical positions related to process safety in the organisation of the site is carried out.
- Organise frequent discussions on process safety. Given the rarity of major incidents, it is recommended to periodically discuss what could go wrong, focusing on the important existing protection measures in the installations.

2.3.4 Employee engagement and involvement

2.3.4.1 Definition

Workers and subcontractors must be involved from the beginning of the process, from design to implementation. Their practical expertise is invaluable for identifying risks and improving procedures.

2.3.4.2 Minimum requirements for staff engagement and involvement

1. Involve workers in the design, development, implementation and continuous improvement of each element of the process safety management system.

2. Identify activities where worker involvement and participation is mandatory (e.g. procedure reviews) and put in place mechanisms to obtain this contribution.

3. Plan and facilitate the active participation of workers in the implementation of the various elements of the Process Safety Management system (e.g. involvement and participation in risk analysis).

4. Put in place mechanisms for workers to give their opinion on process safety issues and ensure appropriate feedback is received.

5. Ensure the implementation of a mechanism for resolving technical conflicts.

6. Ensure that worker recommendations are implemented in a timely manner.

7. Ensure the involvement and participation of subcontractors in process safety issues.

8. Encourage formal and informal activities that reinforce worker involvement.

9. Include personnel from all levels of the organisation in HSE inspection programmes.

10. Involve experienced operations and maintenance personnel in design projects.

11. Ensure a significant presence of managers on the ground.

12. Conduct periodic worker attitude observation operations and solicit their contributions.

13. Create success stories to stimulate interest in worker involvement and participation.

2.3.5 Communication and Transparency with Stakeholders

2.3.5.1 Definition

It is crucial to identify individuals or organisations that may be affected by Sonatrach's activities. This includes local authorities, contracting companies, insurers, associations and other stakeholders.

2.3.5.2 General requirements for transparency with stakeholders

1. Establish a programme to guide external communication using a protocol for each stakeholder.

2. Designate a person responsible for external communication and define their role and responsibilities.

3. Train the person responsible and those involved in external communication.

4. Define the scope and extent of transparency and communication with stakeholders so that the information to be shared is available and verified for all stakeholders.

5. Focus on relevant topics to communicate while protecting commercial and/or confidential information.

6. Identify relevant stakeholders among workers, subcontractors, authorities, neighbours, other industrial sites and other companies in the industry.

7. Develop a crisis communication plan to be implemented in the event of an accidental occurrence in accordance with the requirements of the SONATRACH Emergency and Crisis Management Reference.

8. Determine the channels, methods and means of communication to be used with each stakeholder.

9. Participate in information-sharing activities such as seminars, conferences, study days, etc.

10. Transform positive achievements and events, such as the achievement of good process safety performance, into opportunities for communication with stakeholders.

11. Participate in sectoral events to share and gather information from peer companies.

12. Ensure regular contact with stakeholders, particularly those identified as relevant (ARH, civil protection, etc.).

13. Keep a journal of communication actions up to date to ensure that information requests are met in a timely manner.

14. Request feedback from stakeholders to determine if their concerns and problems have been addressed.

15. Share feedback with site management.

16. Maintain a record of information shared.

2.4 Understanding Hazards and Risks

This pillar is supported by two elements:

Process Knowledge Management

Hazard Identification & Risk Assessment

This element is based on understanding the inherent dangers and risks of the site, taking into account any changes that may occur in the processes and the associated risks that workers interact with.

2.4.1 Process Knowledge Management

2.4.1.1 Definition

This element focuses mainly on information that can be easily recorded, such as:

- Technical documents and specifications;

- Drawings and technical calculation notes;

- Specifications for equipment design, manufacturing and installation;

- Documents arising from modifications; and

- Other documents such as safety data sheets (SDS).

This element includes requirements, the application of which ensures that process-related technical information is:

- Up to date and accurate;

- Stored in a way that facilitates preservation; and

- Accessible to employees who need it to perform their tasks.

Process technical information management also supports and interferes with certain elements such as operating procedures, training, integrity and reliability, change management and accident investigation.

2.4.1.2 Minimum requirements for technical information management

1. Develop a written procedure governing technical information, defining in particular: the scope of the element, roles and responsibilities, the policy for document and record retention, the location and specific regulatory requirements for this aspect.

2. Compile information on chemical risks (such as toxicity, permitted exposure limits, reactivity, etc.), process technology information (such as simplified process flow diagrams, material and energy balances, etc.) and equipment information (such as construction materials, design basis and calculations, etc.).

3. Make information available and up to date.

4. Store design calculation data and similar information in central files.

5. Protect information from accidental loss.

6. Ensure that documentation is structured and easy to use.

7. Eliminate duplicate copies of technical information.

8. Control or restrict access to outdated documents.

9. Periodically review and assess the adequacy of technical information and gather new information if necessary.

10. Provide training to employees on the use and interpretation of data.

11. Ensure a link, preferably electronic, between process-related information and the "Change Management" element.

12. Maintain documents relating to the compliance of installed equipment with engineering standards.

13. Ensure that existing equipment designed and constructed in accordance with codes, standards or practices no longer in use is maintained, inspected, tested and operated safely.

14. Compile technical information related to process safety before proceeding with any risk analysis.

Table 2-1：Different types of technical information related to processes

Risk information

- Other Toxicity Information
- Permissible exposure limits.
- 3. Physical Data;
- Reactivity data
- Corrosivity data.
- Thermal and chemical stability data.
- The hazardous effects of inadvertently mixing typical contaminants (e.g., air, water) with different materials contained in process streams and utility systems.
- Thermodynamic data
- data
- Special hazards
  - ✓ Sensitivity to impact:
  - ✓ Pyrophoric properties.
  - ✓ Chemical stabilizers, including the effects of purification (removal of a stabilizer or other chemical species)
- The maximum deflagration or detonation pressure and flame velocity.
- Industrial hygiene data.

Process Technology Information

- A streamlined PFD flowchart or block flowchart for very simple processes.
- Chemical processes, including laboratory trials that provide information during the early stages of product or process development.
- Hazards related to undesirable chemical reactions (for example, the production of dioxin as a by-product during the processing of chlorinated organic compounds).
- Material balances and energy balances;
- The maximum planned product inventory.
- The upper and lower safety limits for process parameters, such as: temperatures, pressures, flow rates or compositions and the likely consequences of deviations from the safety limits.
- The adiabatic reaction temperature and corresponding pressure, based on both normal and unfavorable product composition.
- Separation equipment design information and design basis (e.g., minimum reflux rate required to maintain safe operation).
- A description of the logic of the control system in narrative form and/or in simple figures.
- Maps and/or tables showing overpressure, thermal and toxic effect areas/distances based on consequence analysis.

Facilities and Equipment

- Building materials.
- Piping and Instrumentation Drawings (P&ID).
- Electrical classification schemes.
- The basis of design and calculations of the backup system, including any torch system.
- The design basis and calculations of the ventilation system.
- The listing of design codes and standards applicable to the process.
- Security systems (e.g. locking, detection or suppression systems).
- Mechanical/basic design data sheets for process equipment.
- the construction Plans
- Piping specifications.
- Isometric plans
- Logic diagrams of the control system, loop sheets and interlocking tables.
- Instrument data, including a register or database of key parameters for field instruments, alarms, interlocks, etc.
- Electrical data, including single line diagrams, a motor database, and grounding/bonding diagrams.
- Facility data, including field plans that document the location of underground utility and treatment pipelines, structural plans and analysis, design, and basic design information for fixed facilities.
- Fire protection systems and information on thermal/blast loads and fire/blast walls.
- The basis of design and analysis for fixed or dedicated winches.
- Location of safety showers/eye wash stations, fire extinguishers and other safety equipment

  Multi-unit portable equipment.

2.4.2 Hazard Identification & Risk Assessment

2.4.2.1 Definition

This element outlines the requirements to help SONATRACH sites better manage hazard identification and risk assessment throughout the entire life cycle of an installation, from design to decommissioning.

A range of tools are available to meet various analysis needs, including:

- Qualitative risk analysis using methods such as Hazard Operability Study (HAZOP), What-if Checklist, Failure Modes and Effects Analysis (FMEA), Failure Modes, Effects and Criticality Analysis (FMECA)

- Semi-quantitative analysis such as Layer of Protection Analysis (LOPA)

- Quantitative risk analysis using methods such as Fault Trees, Event Trees

Hazard identification and risk assessment should be carried out by a team with experience and knowledge of processes and risk assessment techniques. Once the study is complete, the site must implement risk reduction measures to achieve predefined acceptable risk levels.

The main documented outputs of this process are:

- Risk study schedule

- Process risk analysis

- Risk tolerance criteria

- Resolutions and actions implemented

- Residual risks after control measures

- Risk analysis reports

Table 2-2：Example of a typical support for a qualitative risk analysis

Hazard	Causes	CONSEQUENCES	Security Barriers	Recommendations
Fire-resistant				
Explosion				

2.4.2.2 Minimum Requirements for Hazard Identification and Risk Assessment

(1). Establish and implement a risk management procedure in accordance with SONATRACH's HSE Risk Identification and Assessment guidelines.

(2). Document the risk management program at an appropriate level of detail.

(3). Perform risk analysis during the design and construction phase to identify potential hazards from the outset.

(4). Define the scope of each study to ensure compliance with regulations and include all installations. The physical scope can be extended beyond the regulatory requirements depending on the complexity of processes, risks, and the condition of installations and equipment.

(5). Assign personnel to develop risk study schedules, monitor the implementation of recommendations, and advise management on process-related risks.

(6). Define the basis for risk assessment, adopting criteria such as management discretion, qualitative criteria, category criteria, or quantitative criteria.

(7). When selecting risk control measures, consider applicable regulations, codes, standards, good practices, and the principle of reducing risk as low as reasonably practicable (ALARP).

(8). Maintain risk tolerance criteria by periodically reviewing and reacting to incidents, regularly collecting damage data, proactively revising criteria based on damage and stakeholder expectations, or at management's discretion.

(9). Use SONATRACH's adopted risk matrix.

(10). Establish a list of data to be provided to the risk assessment team.

(11). Select an appropriate risk assessment technique.

(12). Ensure the risk assessment team has appropriate expertise.

(13). Define the necessary disciplines (e.g., operations, instrumentation, electrical, mechanical) for the risk assessment team.

(14). Train team leaders and members on the use of risk tolerance criteria.

(15). Adapt the level of technical rigor required for risk assessment based on the installation's life cycle phase and available technical information.

(16). Identify elements critical to safety (EIPS) in accordance with regulations and established procedures.

(17). Select appropriate control measures considering risk acceptance criteria.

(18). Document hazards, risks, and control measures in an official report.

(19). Communicate risk assessment results to site management.

(20). Document residual risks after implementing control measures. These are risks that remain after reducing risks to levels as low as reasonably practicable (ALARP).

(21). Implement and monitor the execution of recommendations. Evaluate the cost, benefits, complexity, and difficulty of implementation for all recommendations resulting from risk assessments.

(22). Ensure that responsibilities and timelines for implementing recommendations are defined in the action plan.

(23). Set up a dedicated system to track the status of all actions until resolution and periodically audit the process to ensure compliance.

(24). Re-evaluate, if necessary, the implementation of recommendations from initial risk assessments (project phase). However, corrective actions taken on operational units should be subject to the change management process (MOC).

(25). Have a plan for internal and external communication, defining stakeholders to be informed about risks.

(26). Archive risk assessment results, key records, and information.

(27). Create a register of major risks, listing and describing prevention and mitigation measures.

(28). Periodically audit the risk identification and assessment process.

2.5 Conclusion

this chapter has provided a comprehensive understanding of Process Safety Management and its crucial role in mitigating industrial risks. By distinguishing PSM from workplace safety management, we recognize their unique contributions to overall safety. The four pillars of PSM serve as a strong foundation for organizations to build upon, fostering a culture of safety and continuous improvement.

Table 2-3 : Risk assessment matrix

					PROBABILITY				
					Unlikely	to learn A distance	Occasional	PROBABLE	Frequent
SERIOUSNESS	population	Facilities	Environment	Reputation	Occurred in global industry but not in SONATRACH	Occurred at another SONATRACH SITE	Occurred at the same site	Occurred several times a year at the same site	Occurred several times in the year in the same place or during the same operation
5 – Catastrophic	Several fatalities	VERY IMPORTANT	Massive effect	International impact					
Severe	A fatality or disability permanent	Material Injury	Major effect	National impact					HIGH
3- Critical	Serious injury or health effects	Limited damage	Limited effect.	Substantial impact			ALARP		
2 = Marginal	Minor injury or health effects	Minor damage	Minor effect	Minor impact					
Negligible	Mild injury or effects The Never-ending	slight harm	Light effect	Slightly impacted	LOW				

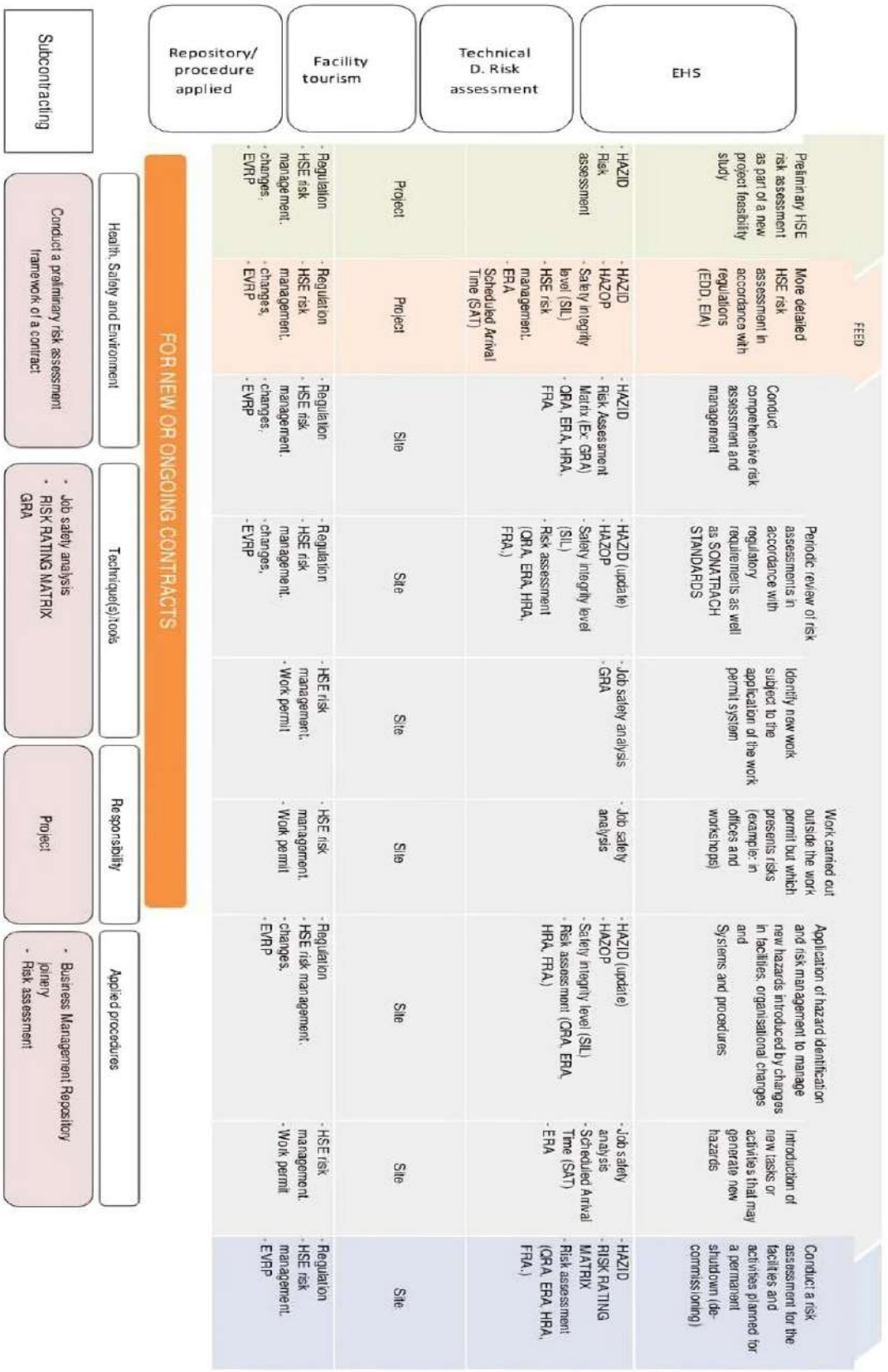

Figure 2-3 : **Application of hazard identification and risk assessment techniques during the lifecycle of an installation**

CHAPTER 03 : Managing Risks and Continuous Improvement

3 Managing Risks and Continuous Improvement

3.1 Introduction

In this chapter, we shift our focus to the practical aspects of risk management and continuous improvement within the context of industrial operations.

3.2 Manager and control risks

This pillar is supported by nine elements:

- Operating procedures

- Safety procedures during work

- Integrity and reliability of installations

- Management of External Companies (contractors) and their subcontractors

- Continuous training and performance assurance

- Change management

- Preparation for start-up of installations

- Conduct of operations

- Emergency and crisis management

3.2.1 Operating procedures/exploitation

3.2.1.1 Definition

Operating procedures describe the specific steps that operators must follow to perform a task safely. They include information on the process, associated hazards, necessary tools and protective equipment.

3.2.1.2 Minimum requirements for operating procedures

(1). Implement a procedure for managing operational procedures, describing in particular the process for their updating and maintenance.

(2). Establish a list of tasks requiring written operating procedures.

(3). Ensure control so that only the procedures in force are used.

(4). Put the procedures in force on a computer network to facilitate access for all staff and protect the documents against loss or unauthorised modification.

(5). Always keep a printed copy of the procedures in force in the control room, to deal with problems linked to the unavailability of the computer network.

(6). Make the printing of operating procedures conditional on a request with an "uncontrolled" mention and a very short expiry time to ensure they will not be used inadvertently in the future.

(7). Carry out a risk analysis linked to each operation. This is likely to indicate the level of detail required for each procedure.

(8). Specify the exceptional actions required for an operation with unusual characteristics.

(9). Include in the procedures all operating modes such as start-up preparation, start-up, shutdown, as well as preparation for maintenance and other non-routine operations.

(10). Use an appropriate format, taking into account the nature of the operation (e.g. narrative, short paragraphs with varied numbering and grouping of information with a logical link, flowchart or checklists, etc.).

(11). Establish safety operating limits for each process parameter and determine the consequences of exceeding these limits.

(12). Deal with limit operating conditions (e.g. do not operate a process without the torch being operational).

(13). Use clear and concise instructions wherever possible.

(14). Supplement the procedures with checklists.

(15). Make effective use of diagrams, especially when the task requires the location of specific equipment or instruments.

(16). Develop written procedures for temporary or non-routine operations such as tests, conditional operations or infrequent operations.

(17). Ensure, if necessary, interconnection (cross-references) between operating procedures, particularly if the procedures are closely linked.

(18). Validate operating procedures and verify that actual practices conform to the planned practices.

(19). Use operating procedures in operator training.

(20). Consider the services in charge of operating the installations as being solely accountable for the systematic application of operating procedures.

(21). Require operators to record the operating conditions of the process several times per shift and submit the records for periodic checks by supervisors.

(22). Require operators to examine the alarm summary reports provided by the automated control system (DCS).

(23). Ensure that the procedures are available and accessible to operators at all times.

(24). Ensure management of any changes that may be introduced into the operating procedures, via a document control system, taking into account the risk involved and following the change management process.

(25). Ensure a review frequency of three years for the examination and revision of procedures, assuming that, in the meantime, the procedures are maintained by the change management process. The site management may consider using event-based rather than calendar-based review periods (for example, it makes more sense to review the unit

shutdown procedures just before a planned revision than according to a fixed annual or semi-annual schedule).

(26). Include in the process/exploitation engineers' missions the responsibility for reviewing operating procedures.

(27). Examine incident reports to detect any deviations from procedures.

(28). Develop a numbering or indexing system for procedures that is logical for the end user.

3.2.2 Safety Procedures for Work

3.2.2.1 Definition

The safety procedures apply to work that is not fully described in the operating or operating procedures. This includes tasks such as the use of heat, excavation work and work in confined spaces.

3.2.2.2 Minimum Safety Procedure Requirements for Work

(1). Develop a procedure describing the process of controlling and authorizing non-routine work, as well as the procedures and permits associated with the SONATRACH Work Permit System.

(2). Define the non-routine operations covered (or not covered) by procedures or permits as presented in Table 05.

(3). Indicate in the procedures the locations subject to the requirements of the procedures or permits.

(4). Develop specific procedures to address particular dangers and/or control work in units that handle dangerous products such as extremely and highly flammable, toxic products, etc.

(5). Ensure that all persons authorizing or carrying out non-routine work are fully aware of the dangers.

(6). Raise awareness among all employees and subcontractors about the dangers associated with the work.

(7). Apply the work permit system to control non-routine interventions.

(8). Ensure that persons authorized to approve permits have the necessary training and experience to understand the dangers and established methods for managing associated risks in accordance with the SONATRACH work permit reference system.

(9). Ensure direct communication between the zone authority or its representative in the area where the work is carried out and the group carrying out the work.

(10). Ensure that ongoing work is properly communicated to potentially affected employees.

(11). Provide training for all work permit actors through on-the-job training, periodic refresher training and specific training for new employees.

(12). Provide additional training for employees who regularly authorize or carry out non-routine work.

(13). Ensure that permit actors, particularly initiators, are well aware of vulnerabilities to particular risks generally encountered during the execution of non-routine work (e.g. establish a procedure for the use of ionizing radiation).

(14). Appoint representatives from each structure (operations, maintenance, technical, new works, HSE) to approve permits and risk assessments in accordance with a pre-established approval matrix.

(15). Keep the list of persons designated to approve permits up to date.

(16). Ensure endorsement by the Site's first manager for the execution of potentially dangerous work.

(17). Adopt multi-copy permit forms to be given to the parties concerned by the work and others displayed at a central point designated for the display of open work permits.

(18). Establish a system to control access to operating areas (process areas), particularly for employees not involved in the operation of installations.

(19). Control access to areas of the installation where particular risks are present (use adhesive tape or barricade with a temporary metal wall or fence the area, and notify operations).

(20). Regularly inspect work areas to determine whether work procedures are being followed and permit requirements are appropriate and applied.

(21). Examine completed permits before filing or rejecting them, and based on the results of the examination, take measures to improve the accuracy and completeness of information.

(22). Classify and archive permits when they expire or when work is completed and permits are closed.

(23). Set up a central point for permit coordination, with a coordinator in charge of verifying permits, recording and coordinating between the actors involved in the work.

(24). Conduct thorough investigations following accidents related to non-routine work.

Table 3-1：Typical activities included in the scope of the security intervention element

Safety intervention procedures to control the risk and protect workers and facilities including:
• Lockout/Tagout and/or Energy Release Hazard Control.
• Opening of line/process equipment.
• Entry to a confined Space
• Hot work permit, including the use of equipment that does not comply with electrical classification requirements.
• Vehicle access.
• Access to specific areas during normal/routine operation (e.g. places where particular hazards may be present).
• Access permit
• Working at Heights: Fall Protection
Procedures for safe intervention to protect against accidents that could have catastrophic side effects including:
• Excavation in or around process areas.
• Driving vehicles in process areas.
• Lifting operation in process areas.
• Use of other heavy construction equipment in or around process areas.
• Hot Tapping Lines and Equipment
Safety procedures to control specific risks including:
• Use of ballistics for torch ignition
• Use of ionizing radiation (for example, to produce radiographic images of process equipment).
Safe work procedures to prevent unauthorized tampering with safety systems including:
• Fire Fighting Networks
• Temporary isolation of depressurization devices.
• Temporary interlock bypass.

3.2.4 Integrity and Reliability of Installations

3.2.4.1 Definition

According to national regulations, integrity is the ability of an installation's equipment to efficiently and effectively perform its functions without failure or any other anomalies that could affect its design characteristics, performance, and intended functions. Integrity and reliability management for installations is a set of approved and recognised practices to preserve equipment or installation integrity, achieved through management tools, practices, and documented procedures. This ensures:

- Compliance with construction standards during design, fabrication, and installation.

- Use of appropriate construction techniques and materials, confirmed by aptitude tests.

- Service continuity through periodic inspection, testing, and preventive maintenance.

Integrity and reliability management focuses on:

- Preventing loss of confinement of dangerous products or sudden release of energy.

- Ensuring high availability and reliability of safety systems or critical devices that prevent or mitigate such events.

Integrity and reliability management should cover the entire life cycle of an installation, from design and fabrication to eventual decommissioning, including periodic inspection, testing, and preventive maintenance activities.

The nature of the industry and type of hydrocarbon installation will determine the scope of integrity and reliability management, which may include:

- Piping systems, pressure equipment, and storage tanks containing chemicals or hydrocarbons.

- Depressurisation and flaring systems.

- Active and passive fire protection systems.

- Safety instrumented systems.

- Control, interlocking, and alarm systems.

- Pumps and compressors.

The ultimate goal of integrity and reliability management is to:

- Improve equipment reliability.

- Reduce equipment failures that could lead to safety and environmental incidents.

- Enhance production quality.

- Improve maintenance efficiency.

- Reduce operational costs.

- Optimise spare parts management.

- Elevate expectations and improve performance of contractors and subcontractors.

- Maintain regulatory compliance.

A well-defined integrity and reliability management system is characterised by:

- Maintaining reliable practices.

- Identifying and categorising equipment and installations covered by the integrity programme.

- Developing, executing, and updating inspection, testing, and preventive maintenance plans based on equipment and installation criticality.

- Ensuring quality and serviceability.

- Managing failures and breakdowns.

- Providing training for personnel involved in integrity and reliability management.

- Analysing data to improve performance.

3.2.4.2 Minimum requirements for integrity and reliability

(a) Maintaining reliable practices

(1) Develop and document a policy for the management of the integrity of facilities and equipment that is consistent with regulatory requirements and the SONATRACH policy.

2) Clearly define the scope of the integrity and reliability management system by determining which assets, facilities, systems and equipment are included or excluded from the management programme/system.

(3) Establish the processes and procedures for the management of the integrity and reliability of facilities.

(4) Define roles and responsibilities based on the processes describing the activities of integrity and reliability management. Charters of responsibilities can be developed based on the organisational procedures that make up management systems, such as maintenance management systems, the inspection management system or the technical management system (technical support).

(5) Involve competent personnel in integrity and reliability management activities.

(6) Base design, inspection, testing and preventive maintenance activities on recognised standards and good practices in the relevant field, through the formal identification of applicable or adopted standards and their referencing to documented practices at all scales of the Site and the Company.

(7) Update practices according to feedback and new technologies.

(8) Establish means of data management and facilitate the continuous improvement of integrity and reliability management practices.

(9) Integrate integrity and reliability management with other Site performance objectives.

(b) Identification and categorisation of equipment and facilities included in the integrity management programme/system

(10) Establish, document and update formal lists of equipment, facilities and systems subject to integrity and reliability management programmes.

(11) Categorise each item identified in these lists according to its criticality in terms of process safety. The determination of criticality should be based primarily on the deliverables of studies and risk analyses carried out or updated during the lifecycle of the facility (EDD, PHA, LOPA, HIRA, HAZOP, etc.).

The determination of equipment criticality is established during the 'evaluation of process risks' phase of initial design, resulting in the list of critical equipment (Safety Critical Element, SCE) or, as per national regulations, EIPS (Elements Important for Safety).

For activities falling within the scope of the integrity management programme, the determination of criticality occurs during operation and involves the evaluation of dynamic risks in the operational phase (results and effectiveness of inspections, management systems, operating conditions, etc.). The most appropriate standardised methods for this activity are risk assessments of rupture or failure using the 'Consequence-Probability Matrix' technique, as defined in ISO 31010 (v2019). Recommended standards for these assessments include:

- API RP 580 'Risk Based Inspection' for pressure equipment.

- API RP 691 'Risk Based Machinery' for rotating machinery.

- ISA 84.00.01 part 1 or IEC 61511 part 1 for Safety Instrumented Systems, SIS.

(12)Develop, document and continuously update inspection, testing and preventive maintenance plans based on regulatory requirements, the criticality assigned to equipment, malfunctions and changes in operating conditions of facilities, equipment and systems.

(13) Continuously update inspection, testing and preventive maintenance plans based on the results of previous activities, current risk assessments of failure/rupture, and changes in parameters and/or recorded exceedances of integrity operating windows (IOWs).

(c). Development and maintenance of procedures, tools, knowledge and skills

(14) Develop and maintain up-to-date organisational procedures (to be included in the Site manual) defining, according to the missions and organisation of the Site, the roles and responsibilities of those involved in integrity management activities.

(15) Organisational procedures can take the form of management or operating manuals (e.g. maintenance management manual, inspection and technical manual). These procedures

may, by their scope, be exhaustive and may cover activities beyond the scope of the integrity and reliability management programme.

(16) Develop and maintain up-to-date procedures for inspection, testing and preventive maintenance activities based on recognised and generally accepted good engineering practices (RAGAGEP).

(17) Procedure documents may include, for integrity management activities, checklists, forms or any other format defining how to carry out these activities.

(18) Procedures can take the form of maintenance and servicing manuals, specifications and technical guides, and recommended practices developed by manufacturers, by the Site or at corporate level.

Procedures should govern the following activities:

- Inspection and testing.

- Critical repairs.

- Preparation for maintenance.

- Material control.

- Safe working.

(19) Update and revalidate procedures through periodic systematic or sporadic checks according to updates to applicable standards or regulations.

(20) Ensure optimal management of the skills of those involved in integrity and reliability management activities by:

- Documenting via job/role descriptions, minimum qualifications and required professional experience for each role.

- Defining the training and certifications required for each role using training matrices.

- Planning and delivering the training and certifications defined in the established training matrices.

Matrices of training for each role should be developed in line with the activity, in coherence with job descriptions and responsibilities defined in organisational procedures.

Targeted training includes that related to safety in the workplace, as well as qualifications and certifications specific to certain roles such as inspection, monitoring, welding, NDT, etc.

(21) Provide and maintain adequate tools for integrity management activities by supplying, establishing rules for their use and maintaining them in good working order.

Tools for integrity and reliability management activities may include, but are not limited to:

- IT solutions for activity management such as CMMS, SAP, etc.

- Data management solutions such as IDMS, RBI, IOW, etc.

- Maintenance and inspection tools and equipment.

- For certain integrity management activities such as inspection, testing and maintenance, the provision of tools may be outsourced and carried out by third parties.

(d) Assurance of continued fitness for purpose

(22) Carry out source inspections in accordance with approved quality plans/inspection and test plans (ITPs) based on normative good practices.

(23) Carry out and document initial inspections (Zero Inspection) after installation of new equipment or during the commissioning phase of projects.

(24) Plan, carry out and document in-service inspections and tests in accordance with established ITPs.

(25) Plan, carry out, control and document preventive maintenance, repairs, calibration and adjustment tests.

(26) Carry out spare part verification programmes according to documented procedures.

(27) Keep records of the above activities throughout the lifecycle of equipment, systems or facilities.

(28) Failure management.

(29). Ensure, for each piece of equipment, the identification of degradation mechanisms and integrity operating windows (IOWs) beyond which degradation mechanisms accelerate and associated degradation modes occur.

(30). Monitor the behaviour of equipment, components and systems in the face of predefined degradation mechanisms, using condition monitoring activities, preventive in-service inspections and proof tests, as well as monitoring of IOWs.

(31). Ensure fitness for service assessments for detected failures, in accordance with API 579 'Fitness For Service'.

(32). Ensure the quality of equipment repairs according to regulatory and normative requirements, in terms of procedures and qualifications of those involved.

(e). Data analysis and management

(33). Establish the means necessary for the collection of data to enable the planning of inspection, testing and maintenance activities.

(34). The most appropriate IT solutions for data collection and analysis are IDMS (Inspection Data Management System), combined with solutions from other PSM elements such as MOC, alarm management relating to exceedances of SOLs or IOWs, etc.

(35). Ensure the archiving of data relating to decommissioned equipment.

3.2.5 Management of external companies (contractors) and their subcontractors

3.2.5.1 Definition

The control system aims to ensure that external company workers can carry out their work safely. It is also about ensuring that subcontracted work does not create additional risks at the facility.

3.2.5.2 Minimum requirements for the management of external companies (contractors) and their subcontractors

(1) Develop an HSE management procedure for external companies and their subcontractors, in line with the SONATRACH External Companies and Subcontractors HSE Management Reference.

(2) Appoint a supervisor for the external company and its subcontractors.

(3) Define the roles and responsibilities of SONATRACH site personnel in charge of monitoring the management program for external companies and their subcontractors.

(4) Communicate HSE management requirements to subcontractors.

(5) Train relevant site personnel on the management process for external companies and their subcontractors.

(6) Maintain safety performance records for external companies during the contract, including inspection and audit results and HSE statistics.

(7) Include site HSE safety expectations in the tender documents sent to bidders.

(8) Select external companies based on operational capabilities, past performance, and the quality of their safety systems.

(9) Consider SONATRACH site's past experience with the external company when making contract decisions.

(10) Hold a pre-job meeting with the selected external company to discuss safety issues.

(11) Identify appropriate training requirements for external company personnel.

(12) Define who will provide the different types of training.

(13) Provide induction, ongoing, and refresher training for external company personnel.

(14) Use external company performance and incident records to modify the training program if needed.

15. (15) Identify required certifications for special qualifications, such as welders, heavy equipment operators, NDT technicians, etc.

(16) Include external company personnel in relevant emergency response exercises.

(17) Provide sufficient information to the external company about SONATRACH's HSE policy, relevant procedures, and safety rules.

(18) Promptly resolve safety issues identified by external companies.

(19) Participate in preparing and evaluating work programs, with a focus on those involving high-risk tasks.

(20) Maintain records of work-related accidents and occupational diseases occurring during the contract.

(21) Keep records of permits issued under the contract.

(22) Maintain control over temporary installations of the external company (ad hoc and/or continuous control).

(23) Integrate information provided by the external company into the process technical information management program.

(24) Establish an audit program for the external company selection process.

(25) Conduct unannounced inspections at external company work sites.

(26) Attend safety meetings of external companies.

(27) Conduct and document, at the end of the contract, an evaluation of the external company's performance and share it with other SONATRACH sites.

3.2.6 Practical training and performance assurance

3.2.6.1 Definition

Practical training aims to enable workers to ensure an initial minimum level of performance, maintain their skills and qualify for more demanding promotions. It is a continuous process to ensure that acquired knowledge is put into practice and that required performance levels are met.

3.2.6.2 Minimum training requirements and performance assurance

1. Develop a procedure governing process safety-related training.

2. Create detailed guidelines for training requirements for each job.

3. Define roles and responsibilities in the procedure.

4. Ensure systematic identification of training needs.

5. Ensure training needs address gaps between required and actual competencies.

6. Continuously evaluate performance and correct deficient behaviours.

7. Describe interfaces between the training element and other process safety management elements, especially change management.

8. Define required qualifications for trainers.

9. Identify indicators to judge the effectiveness of the training program through evaluations by learners, impartial observers, performance test scores, and worker performance (e.g., operational errors, process stability, recorded incidents).

10. Periodically evaluate workers' knowledge, skills, and aptitudes against requirements.

11. Examine incident investigations and address training-related issues.

12. Maintain a library of training materials.

13. Ensure training materials are up-to-date and reflect procedural changes.

14. Maintain records of trained workers, performance, and future training needs.

15. Identify knowledge, skills, and aptitudes necessary for successful task completion.

16. Seek worker input on required training.

17. Determine required linguistic and literacy competencies.

18. Define, in subcontracts, the training required for contractor workers and associated responsibilities.

19. Perform gap analysis between job candidates' competencies and requirements.

20. Perform gap analysis between current job holders' competencies and requirements.

21. Identify the target population for process safety training (operators, maintenance staff, engineers, etc.).

22. Identify individual prerequisites for training modules.

23. Identify the best way to present each training module (e.g., e-learning, software, simulator) and the optimal location (e.g., classroom, workshop, laboratory).

24. Identify sensitisation training on process dangers and emergency procedures.

25. Identify necessary training before on-site practical training.

26. Develop methods to test learners' progress and performance against minimum requirements.

27. Identify knowledge, skills, and aptitudes requiring periodic testing to ensure performance standards.

28. Establish indicators to alert management about rapid increases in operational errors.

29. Enhance training effectiveness using virtual tools, computer-based training, software, and simulators.

3.2.7 Change management

3.2.7.1 Definition

Change management is defined as the set of formally established and documented activities designed to prevent the introduction of uncontrolled new hazards through changes that may be made at Sonatrach sites. In its broadest definition, change is any addition, process modification, or substitution of an element (equipment or part thereof, product, organisation or personnel) other than replacement in kind.

Algerian legislation specifically defines modifications as any change made to the conditions that prevailed during the design and which do not fall within the limits set by the requirements issued by the project owner and/or the applicable standards.

The most simplified process for effective change management consists of the following steps:

1. Proposal of the change

2. Examination of the proposal by qualified and independent personnel to determine potential negative risk impacts and suggest additional measures to manage the risk

3. Authorisation or rejection of the change based on the examination

4. Notification or training of potentially affected employees and updating of documents concerned by the change

The purpose of a change management system is to have a correctly examined and authorised change proposal that identifies and ensures the implementation of appropriate risk controls for the proposed change. This process should also include appropriate revisions or updates to other elements of the process safety management (PSM) system, such as the modification of process-related technical information and communication/training regarding

the change. The results of the implementation of the change management element contribute to the improvement of the performance of other PSM elements.

3.2.7.2 Minimal Requirements for Change Management

1. Establish and implement documented procedures for change management, defining roles and responsibilities.

2. Ensure the organisation and resources cover all predefined change situations, such as committees, validation entities, and dedicated MOC functions.

3. Ensure qualified, competent, and trained personnel for change management activities.

4. Maintain the effectiveness of practices through records and periodic audits and reviews.

5. Precisely define the scope of changes, including temporary, emergency, and permanent changes.

6. Precisely define the types of changes to be included in the change management system, such as process modifications, chemical changes, document updates, etc.

7. Clearly define the limits of identical changes.

8. Provide specific examples of changes and identical changes for each category to prevent inadvertent bypassing of the management system.

9. Provide appropriate input for change management.

10. Apply appropriate technical rigour to the change examination process.

11. Ensure change examiners have the necessary expertise and tools.

12. Identify functions with technical authority for verification, validation, and approval in change management procedures.

13. Ensure that change authorisations consider identified risks.

14. Identify review supports to be used before implementing changes, such as pre-startup safety review (PSSR) forms.

15. Update all technical information before implementing changes.

16. Communicate changes to concerned parties.

17. Provide necessary training for personnel to adapt to changes and record related actions.

18. Ensure continuous monitoring for temporary or emergency changes.

19. Maintain records of change management activities.

3.2.8 Pre-Start-Up Safety Review (PSSR)

3.2.8.1 Definition

This section outlines the requirements for effective start-up safety reviews, which are necessary for new installations, installations that have been shut down for modifications or revisions, and installations that have been shut down for other reasons. It also covers regulatory requirements for such reviews and the need to ensure that safety procedures, operating procedures, maintenance, and emergency procedures are in place. The section

emphasizes the importance of training personnel on the changes and maintaining up-to-date technical information. It also highlights the

need for continuous monitoring and periodic reviews to ensure the effectiveness of start-up safety procedures.

3.2.8.2 Minimal Requirements for Start-Up Safety Reviews

1. Ensure consistent implementation by establishing documented procedures and forms covering all pre-start verification operations and associated controls and checks.

2. Ensure periodic reviews of operational preparedness practices through management reviews and audits.

3. Provide appropriate inputs for the pre-start review, identified in dedicated lists or forms.

4. Involve appropriate resources and personnel by identifying individuals or groups involved in each type of preparation, and provide them with appropriate tools, such as access to test and inspection results.

5. Comply with regulatory requirements governing start-up preparation.

6. Use tools, including checklists, for conducting and documenting the review of this element.

7. Implement a system that provides assurance of the effectiveness of start-up preparation and allows for improvement.

8. Communicate the decisions and actions of the start-up readiness review in a formal manner.

9. Ensure, if necessary, an update of process-related technical information after each start-up. This update should be based on the experience gained during the start-up preparation process.

10. Keep records of start-up preparation activities up to date.

3.2.9 Operation Management

3.2.9.1 Definition

Operation management involves the management of a company's day-to-day activities. It includes the coordination and supervision of short- and medium-term operations, while ensuring alignment with the company's strategic objectives. Operation management helps reliably accomplish the company's mission and advance it towards its goals. It encompasses a continuous management system that encourages the sustainable and appropriate execution of all tasks.

3.2.9.2 Minimal Requirements of Operation Management

1. Define the specific roles and responsibilities in conducting operations.

2. Develop procedures, permits, checklists and other written standards governing operations.

3. Train all workers and subcontractors concerned on procedures and on conducting operations.

4. Identify interfaces between the operational discipline and the other elements of the process safety management system, in particular training, operating procedures, safety intervention, integrity and reliability of installations and equipment.

5. Develop specific operational control procedures that deal with hazardous products.

6. Identify indicators by which the effectiveness of operations will be judged.

7. Examine the results of investigations into incidents whose causes are related to a deficiency in the conduct of operations.

8. Define management expectations, with respect to workers, regarding the conduct of operations.

9. Develop and implement operating and maintenance checklists.

10. Coordinate on-the-job training activities by ensuring real working conditions.

11. Allocate adequate resources for the conduct of operations.

12. Encourage open communication.

13. Encourage teamwork.

14. Formalise communications through protocols between shifts.

15. Enforce compliance with operating safety limits and restrictive conditions for operations.

16. Establish operating procedures for abnormal/temporary situations.

17. Establish and formalise a system to control access to control rooms and the operating area.

18. Control access to areas where particular risks exist.

19. Set up a recording device for operators' rounds.

20. Develop or adopt standards for equipment labelling and colour coding.

21. Ensure lighting in operating areas.

22. Develop a verification and monitoring programme for instruments and tools.

23. Encourage workers to report observed failures.

24. Hold workers accountable for their performance and evaluate them.

25. Define performance indicators and progress towards improvement objectives.

26. Ensure that workers are physically and mentally fit to perform their required tasks.

27. Establish a system to regularly inspect work areas.

28. Correct deviations from practices and procedures whenever they are identified.

29. Ensure a sharing of best performances and benefits collected as workers readily adopt objectives when they see a direct advantage for themselves.

3.2.10 Emergency and crisis management

3.2.10.1 Definition

An emergency is an unexpected, urgent event requiring immediate action. Emergency management is the global approach to preventing emergencies and managing those that do occur.

3.2.10.2 Minimum Requirements for Emergency and Crisis Management

1. Develop an emergency management plan defining roles and responsibilities, actions and interface with stakeholders in accordance with Executive Decree 09-335 setting out the modalities for the development and implementation of internal intervention plans by operators of industrial installations and the Sonatrach Emergency and Crisis Management Reference (ICS).

2. Implement the emergency management system at the site level.

3. Define the scope of the emergency response plan, including:

- The physical extent to which the emergency response plan applies;

- The types of emergencies envisaged or excluded, for example, fires, explosions, exposure to toxic products;

- Types of actions to be undertaken by the establishment's personnel, for example, using establishment personnel in fire fighting;

- Possible integration with other response agencies (adjacent sites, civil protection, etc.;

- The regular review of the emergency plan with external agencies that may be called upon to respond and the resolution of any conflicts.

4. Ensure periodic audits of emergency plans to verify compliance with Algerian regulations and Sonatrach requirements.

5. List the accident scenarios identified in risk studies (Hazard Study, Investigations, MOC, etc.) and also take into account scenarios based on expert opinion.

6. Take into account, in emergency management plans, a wide range of risks, including those related to transport and business continuity.

7. Have specific procedures for emergency management in case of release of highly toxic products, and specific plans for certain other events (warnings for hazardous events related to natural events (e.g. earthquake, flooding, etc.).

8. Model the expected impacts of scenarios to determine the geographical area (effect radii) that could be affected for each scenario.

9. Expand the range of scenarios to include events that are not process-related, such as confined space rescue.

10. Take into account, in emergency plans, the minimum training required for responders.

11. Conduct simulation exercises on the implementation of the emergency and crisis management plan.

12. Determine the scenarios requiring intervention by the site response team, alone, with assistance (within the framework of the mutual aid plan), or with the involvement of local authorities.

13. Identify emergency response equipment, tests and required inspections, and establish a system to ensure that the equipment is properly maintained and tested.

14. The maintenance of emergency response equipment must be managed and monitored in a CMMS.

- Based on the plans developed, provide the facilities and equipment necessary for the execution of the plans.

- Ensure accessibility to emergency response equipment.

- Using a checklist, conduct an annual (minimum) inventory of emergency response consumables, paying particular attention to expiration dates.

- Identify emergency evacuation equipment, including inspections, tests and other preventive maintenance or replacement operations and establish a system to ensure that equipment is properly maintained and tested.

- Include in the emergency response plans, directly or by reference, the procedures used by operators and other site personnel to deal with small spills/releases and fires (generic instructions, SDS, use of fire extinguishers, evacuation to a safe area).

15. Provide a means of alerting all personnel to the emergency and the measures to be taken to protect themselves, taking into account the following points:

- A single site-wide emergency alarm is used;

- The alarm includes a code (for example, the code may be a combination of long and short horn blasts) indicating that an emergency has been declared;

- Define the location of the emergency;

- Indicate to workers the measures to be taken;

- Have a public address system to use to describe the nature of the emergency and provide verbal instructions to workers.

16. Have equipment (telephones, radios, internet, etc.) for emergency communications, including employee notification, communications with emergency response team members, with external authorities and with the media and other stakeholders.

17. Train all members of the command post and response teams in all the skills necessary to effectively and safely conduct an emergency response or rescue operation.

18. Ensure initial and refresher training for the response team, covering mainly basic skills such as setting up and checking protective equipment;

19. Provide theoretical and practical training through response exercises. They must take place in operating areas and under realistic conditions.

20. Ensure that all site personnel, including subcontractors, are able to recognise emergency alarms and the measures to be taken for each type of alarm.

21. Train managers and technical personnel who play an active role in emergency management but who are not directly involved in the tactical management of the emergency and are not part of the emergency response team. This training should cover mainly the procedures governing specific tasks in relation to emergency and crisis management.

22. Ensure, in consultation and coordination with local authorities, that residents near the site are aware of the measures to be taken in the event of an emergency.

23. Keep emergency response plans up to date and review them periodically, taking into account the following points:

- Ensure an annual certified review of emergency plans;

- Examine the plans before and after exercises on the basis of the proposed corrective actions;

- Ensure a review of proposed changes in terms of their impact on emergency response plans, for a possible update.

24. Conduct periodic simulation exercises to assess the effectiveness of the plan and the level of preparedness of the command and response team, taking into account the following provisions:

- Exercises limited to the actions of the response team with little or no integration with operators;

- Joint exercises with neighbouring sites;

- Independent observers are appointed to evaluate performance;

- Exercises involving operational personnel;

- Crisis management exercises reserved for managers and those involved in tactical management;

- A meeting must be held after each exercise (or real response) to discuss the exercise (debriefing);

- Conduct a formal critique after each exercise, using independent and experienced observers;

- The response team leader must take notes and decide, if necessary, on any corrections to be made;

- Key members of the emergency response team must meet with site management after each exercise or major response activity, and discuss improvements to be made;

- Improvements must be followed up until their completion using a formal management system.

25. Provide initial and refresher training, as needed, on crisis communication.

26. Put in place a requirement that managers and employees are not authorised to communicate with the media under any circumstances; this responsibility is entrusted to Sonatrach's General Management.

27. Condition the site manager's communication with the media on authorisation from Sonatrach's General Management.

28. Ensure training for site managers on crisis communication.

29. Establish a solid relationship with local authorities, civil protection, neighbouring sites and representatives of civil society.

30. Examine the opportunity to establish contracts and assistance plans with companies specialising in environmental incident response.

31. Develop plans describing the general layout of response equipment, evacuation routes and special risks in each operating area.

32. Include in the training, for operating and maintenance personnel, the actions to be taken in an emergency.

33. Address site security issues in emergency and crisis management plans.

34. Take into account intentional attacks in the emergency and crisis management plan.

35. Business continuity management is the responsibility of the Activity under the authority of Sonatrach's General Management.

3.3 Learning from experience

This pillar is supported by four:

- Incident analysis and feedback

- Process safety performance indicators

- Audits

- Management review and continuous improvement.

The management system of each of these elements is based on a real understanding of the risks associated with the processes with which workers interact.

3.3.1 Incident analysis and feedback

3.3.1.1 Definition

This element describes the characteristics of an effective program to enable SONATRACH sites to improve the process of incident investigation.

Learning from incidents (accidents and near-misses) and taking the necessary measures to prevent their recurrence are essential elements of improving health, safety and environmental performance. That is why SONATRACH sites must ensure that incidents are systematically reported and investigated, and that the actions and lessons identified are implemented in a timely manner.

3.3.1.2 Minimal Requirements for Accident Analysis and Feedback

(1). Develop and implement procedures for reporting, collecting data, investigating and learning from incidents in accordance with the SONATRACH Accident and Incident Investigations Reference Manual.

(2). Ensure that the investigation process includes the following steps:

- Immediate actions

- Investigation plan

- Data collection and analysis

- Corrective actions and analysis

(3). Define the technical scope of the incident element by specifying risk and consequence thresholds that trigger different levels of investigation.

(4). Provide awareness and refresher training to employees and subcontractors on incident reporting.

Causal factors

Equipment failure

Human error

Underlying causes

Task control problems

Process control problems

Management system problems

Organizational culture problems

(5). Provide training on root cause analysis (RCA) to investigation leaders, focusing on the skills needed to lead an investigation team and on analysis techniques.

(6). Develop and collect performance indicators related to the incident investigation process.

(7). Conduct reviews of the incident investigation process.

(8). Perform data analysis, such as records and trend curves, to help identify near-misses and incident triggers.

(9). Identify and eliminate barriers that may hinder incident reporting.

(10). Initiate investigations as soon as possible after an incident.

(11). Set appropriate deadlines for notification to persons/structures/institutions.

(12). Establish a formal interface between the emergency and crisis management element and the accident analysis and feedback element.

(13). Use effective methods in interviews.

(14). Identify all direct and indirect causes based on an in-depth analysis.

(15). Develop recommendations for each identified cause and consequence.

(16). Involve personnel with incident analysis expertise in investigations.

(17). Define specifications for the content of investigation reports.

(18). Share findings and lessons learned with all SONATRACH sites.

(19). Respect confidentiality of matters.

(20). Analyse data related to incidents that occurred at other sites.

(21). Develop a policy for retaining investigation-related documents.

(22). Feed the database from all possible sources.

(23). Perform periodic analysis of the incident database to identify negative trends.

3.3.2 Key Performance Indicators Related to Process Safety

3.3.2.1 Definition

These indicators are more proactive. They measure the performance of a process, an operational discipline or a protective barrier that prevents incidents. They allow you to anticipate potential problems.

3.3.2.2 Minimal Requirements for KPIs

(1). Establish and implement a formal procedure for developing and maintaining performance measures related to process safety management.

(2). Designate the entity in charge of (the owner) of the measurement system, responsible for regularly monitoring the effectiveness of this element.

(3). Develop KPIs for each element of the PSM system.

(4). Collect and update measurement data at appropriate intervals by defining a formal data collection schedule.

(5). Determine the areas of the installation where the KPIs element should be applied.

(6). Provide appropriate training to personnel with a particular role in the KPIs management system.

(7). Ensure the availability of appropriate tools for data collection and updating.

(8). Maintain the measurement and KPIs recording system.

(9). Summarise and communicate KPIs to relevant stakeholders in an appropriate format.

(10). Ensure that performance measures used lead to corrective action; otherwise, this becomes a resource-wasting factor.

3.3.3 Management review and continuous improvement

3.3.3.1 Definition

Management review consists of regularly checking the status of the process safety management system. Its purpose is to identify and correct any actual or emerging deficiencies before they are revealed by an audit or incident.

3.3.3.2 Minimum Requirements for Management Review

1. Develop a management review policy.

2. Include specific roles and responsibilities in the management review system, reinforced by an active accountability system.

3. Develop management review protocols.

4. Establish reference schedules for reviews (at least once a year).

5. Identify measures by which the effectiveness of management reviews will be judged.

6. Establish the scope of the management review.

7. Confirm the management review schedule.

8. Collect the necessary information for the management review, such as measurements and indicators, and trend curves for specific parameters.

9. Prepare a presentation, including KPIs, analysis, and improvement proposals.

10. Hold the management review meeting.

11. Evaluate the strengths, weaknesses, and gaps in the implementation of the process safety management system.

12. Document and communicate the review to the relevant parties.

13. Develop an action plan to address the findings of the review.

14. Assign responsibilities and set deadlines.

15. Monitor and document the resolution of recommendations through the implementation of an integrated corrective action tracking system.

16. Identify relevant measures and indicators for each element of the process safety management system.

17. Monitor process safety performance trends over time.

18. Implement management system improvements to address weaknesses.

19. Periodically verify work practices on the ground to ensure compliance with the requirements of the process safety management system.

3.4 Conclusion

this chapter has offered valuable insights into the practical implementation of risk management strategies and the pursuit of continuous improvement. By examining the diverse elements involved in managing risks.

GENERAL CONCLUSION

GENERAL CONCLUSION

this dissertation has provided a comprehensive understanding of the importance of effective industrial risk management strategies and their successful implementation within Sonatrach. By exploring the intricacies of process safety management, the practical aspects of risk management, and the pursuit of continuous improvement, we recognize the significant role these strategies play in ensuring the well-being of individuals, the environment, and communities at large. As we reflect on the insights gained, it is evident that a combination of robust systems, proactive initiatives, and a strong safety culture are essential to mitigating risks and fostering a sustainable future for the industry.

Guaranteeing control over major industrial risks involves
Implementing training programs to enhance employee skills and knowledge for safe operations.
Establishing clear HSE policies and conducting regular risk assessments to identify and mitigate hazards .
The combination of regulatory adherence and SONATRACH's initiatives:
Strengthens the company's ability to manage risks comprehensively, protecting employees, assets, and the environment .
Continuous improvement and compliance with standards:
SONATRACH's commitment to monitoring and evaluating HSE performance ensures ongoing enhancement of risk management practices .
In the end, we hope to assist the company first in identifying some shortcomings that may not have been considered to adopt the Process Safety Management System, and to help future students use this project as a reference for them.

ABSTRACT , RÉSUMÉ , ملخص

ABSTRACT , RÉSUMÉ , ملخص

Abstract

This academic thesis comprehensively explores the various strategies employed in industrial risk management and their practical implementation within Sonatrach, Algeria's state-owned oil and gas company. The chapters delve into the intricate nuances and multifaceted dimensions involved in understanding and addressing risks in the industrial realm, with a particular emphasis on the critical areas of process safety management and the continuous pursuit of continuous improvement. Through a meticulous analysis encompassing pivotal definitions, current regulatory frameworks, and pertinent real-world illustrations, the primary objective is to offer invaluable insights that highlight the indispensable role of effective risk management in ensuring the welfare of employees, environmental preservation, and the overall well-being of neighboring communities.

ملخص

تستكشف هذه الأطروحة الأكاديمية بشكل شامل مختلف الاستراتيجيات المستخدمة في إدارة المخاطر الصناعية وتنفيذها العملي داخل شركة سوناطراك، وهي شركة النفط والغاز المملوكة للدولة في الجزائر. وتتطرق الفصول اللاحقة إلى الدقائق المعقدة والأبعاد المتعددة الجوانب التي ينطوي عليها فهم المخاطر ومعالجتها في المجال الصناعي، مع التركيز بشكل خاص على المجالات الحرجة لإدارة سلامة العمليات والسعي المستمر نحو التحسين المستمر. ومن خلال تحليل دقيق يشمل التعاريف الحاسمة والأطر التنظيمية الحالية، بالإضافة إلى التوضيحات الواقعية ذات الصلة، يتمثل الهدف الأساسي في تقديم وجهات نظر لا تقدر بثمن تسلط الضوء على الدور الذي لا غنى عنه والذي تلعبه إدارة المخاطر الفعالة في ضمان رفاهية الموظفين والحفاظ على البيئة والرفاهية العامة للمجتمعات المجاورة.

Résumé

Cette thèse universitaire explore de manière exhaustive les différentes stratégies employées en matière de gestion des risques industriels et leur mise en œuvre pratique au sein de Sonatrach, la compagnie nationale algérienne de pétrole et de gaz. Les chapitres abordent les nuances complexes et les dimensions multiformes impliquées dans la compréhension et la gestion des risques dans le domaine industriel, en se concentrant particulièrement sur les aspects critiques de la gestion de la sécurité des processus et de la recherche continue d'amélioration continue. À travers une analyse minutieuse englobant des définitions déterminantes, les cadres réglementaires actuels et des illustrations concrètes pertinentes, l'objectif principal est d'offrir des perspectives précieuses qui soulignent le rôle indispensable d'une gestion efficace des risques pour assurer le bien-être des employés, la préservation de l'environnement et le bien-être général des communautés voisines.

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