



Role of Process Safety Strategy in Behavior Based Safety Exploratory Study for ADNOC Abu Dhabi UAE

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Abstract

High risk activities such as oil and gas production require strict safety management systems to ensure that no incidents occur and that people, assets and the environment are protected. In this context two approaches have developed to support the improvement of the safety performance in the organization: the implementation of process safety strategies and the implementation of behavior-based safety (BBS) programmes. This research is an exploratory study that investigates process safety strategy as a way of improving behavior-based safety practices in the operations of Abu Dhabi National Oil Company (ADNOC) in Abu Dhabi, United Arab Emirates (UAE). The study aims to identify the behavior of employees, leadership commitment, hazard awareness, risk communication, operational procedure compliance, and the establishment of a proactive safety culture regarding the influence of process safety principles. To gather information on the experiences and perceptions of process safety management workers, supervisors and safety professionals, a qualitative exploratory research design was used. Interviews, workplace observations and analysis of documents containing safety procedures and operational guidelines were used to collect data. Thematic analysis was used to uncover themes and establish commonalities between responses with regards to safety leadership, employee engagement, incident prevention, safety reporting and continuous improvement programs. The results suggest that a clear process safety strategy further enhances behaviour based safety by prompting consistency in following critical operating procedures, by encouraging employees to report hazards and near misses, by reinforcing accountability at every organizational level and by adding a high level of employee engagement in process safety. The factors that were identified as key drivers for positive safety behavior included: Leadership visible, Competency development (routine) planned, Effective risk assessment (planned) and Continuous monitoring (routine). Furthermore, the study also highlights challenges such as employee resistance to change, communication, operational pressures and employee participation in safety programmes. The study finds that by combining process safety management and behavior-based safety, a robust process safety management program is established for high hazard industries that help minimize operational risk and enhance organizational resilience. The findings provide valuable insights for safety managers and policymakers in creating a safety culture and high-performance organization within ADNOC and other energy firms. The study will help advance the knowledge of the integration of technical process safety systems and human behavioral approaches toward sustainable workplace safety.

Keywords: Process Safety Strategy, Behavior-Based Safety (BBS), Process Safety Management, Safety Culture, Safety Leadership, Employee Safety Behavior, Risk Assessment, Hazard Identification, Incident Prevention

1. Introduction

Oil and gas operations are often complex, with the use of hazardous materials and high-risk activities, requiring advanced safety management systems. The reliability of the equipment, engineering controls and the behaviour, awareness and decision making of the workforce are also critical for integrity of operations in this kind of environment. In the past, industrial incidents around the globe have proven that there is no technology that can remove risk if risky behaviors, poor communication, or poor safety cultures exist in an organization. Hence, the integration of process safety with BBS has emerged as a crucial approach to mitigate workplace incidents and enhance organizational resilience.

Process safety is about preventing catastrophic events caused by the uncontrolled release of a hazardous substance or failure of a critical process system. It involves hazard identification, risk assessment, asset integrity management, operational discipline, emergency preparedness and ongoing process performance monitoring. While occupational safety focuses on preventing injury to people, process safety aims to prevent low-frequency, high-consequence events that may impact people, communities, infrastructure, and environments. Process safety strategies, therefore, depend on systematic planning, leadership commitment, compliance with the prescribed procedures and continuous improvement of process through learning.

Behavior Based Safety is complementary to process safety by focusing on the importance of human behaviors in accident prevention. BBS is a way to promote staff to recognize safe and unsafe behaviors, to watch how the job is done, offer positive input, and to be involved in making the work site safer. Behavior-based interventions focus on engaging, coaching, communicating and recognizing employees for positive safety behaviors instead of blaming them. Regularly, employees exhibit safety behaviors and proactively identify potential hazards, which helps organizations avoid operational failures and enhance overall safety performance.

Process safety strategy and behavior-based safety have been gaining more focus in high-risk industries because accidents generally occur not because of a single technical failure, but as the result of multiple organizational failures. However, many incidents are triggered by several interrelated factors, such as procedural failures, inappropriate risk assessment, poor supervision, lack of skills preparation and communication issues. For a comprehensive safety strategy, there must be coordination among the engineering, management systems and behavior of the workforce. It is a holistic approach that will help employees not only to understand the requirements of safe procedures but also the value of compliance in minimising large accidents.

Abu Dhabi National Oil Company (ADNOC) is one of the world's largest integrated energy companies with upstream, midstream, downstream and petrochemical activities in the United Arab Emirates. In view of the scope and complexity of its business, ADNOC has developed comprehensive health, safety and environmental management systems focused on process safety excellence, operational reliability and protecting its people. The organisation's commitment to a high level of operational safety is reflected in regular investment in safety leadership, employee competency development and digital technologies, and in employee participation. However, it is important to continuously monitor the effectiveness of the process safety strategies on employee behaviors and on the organization's safety culture to ensure these standards are being maintained. An exploratory study would be appropriate to examine this relationship, particularly if the perceptions, experiences and practices of organizations were to be studied, which are not easily captured by quantitative performance measures. Understanding employee competence and attitudes regarding their process safety requirements, how well they receive process safety related behaviours initiatives and their participation in process safety related decision making processes can provide some indication of the effectiveness of the process safety strategy in place. This kind of information may also help to understand ways to improve employee engagement, employee safety training, leadership involvement and communication in various operations.

In addition, the changing nature of the threats in the industry such as technological change, digital monitoring systems, remote working, contractor management and ever more complicated production processes demand an increased focus on both the technical and the behavioural aspects of safety. A strong safety culture relies on engineering excellence, shared responsibility, learning and proactive risk management. However, those organizations that can integrate process safety concepts with effective behaviours are more likely to be able to make sustainable improvements in their operational performance, workforce health and safety and environmental protection.

With the above background, the current exploratory study explores the role of process safety strategy in the context of behavior-based safety practices in ADNOC, Abu Dhabi, UAE. This study aims to explore the impact of process safety efforts on attitudes, adherence to safety protocols, hazard reporting, management involvement, and safety culture. The results will be useful for the development of knowledge on the integrated safety management and will provide practical suggestions to improve existing behavioural safety programmes in the oil and gas sector.

2. Background of the study

Oil and gas industry are one of the most dangerous industrial production areas, where complicated production processes, high operating pressure, flammable materials and technologically advanced production systems demand a strict control

of safety during their operation. These environments require engineering controls, regulatory compliance, as well as organizational processes, operational discipline and employee behavior integration to prevent major accidents. In the last two decades, the major energy companies have come to increasingly see that sustainable safety performance can be obtained by having a balance between process safety management and behavior-based safety (BBS) programs. Process safety strategy involves the prevention of catastrophic events, such as release of hazardous materials or failure of a critical process system. It involves identification and assessment of risk, hazard analysis, mechanical integrity, asset reliability, emergency preparedness, management of change, operational excellence and continuous monitoring of safety-critical barriers. These elements are intended to support industrial process stability, predictability and robustness under normal and abnormal operating conditions. While occupational safety focuses mainly on personal injuries and unsafe acts, process safety takes the approach of preventing low frequency, high consequence events that can result in serious injury to people, adverse effects on their communities, impacts on the environment and loss of business continuity. BBS is an increasingly effective management tool for improving safety in the workplace by empowering workers to recognize unsafe behaviors, remind them to work safely, and to engage in hazard prevention. These programs on BBS usually focus on observation, constructive feedback, peer engagement, leadership commitment and learning. Good BBS programmes are based on positive reinforcement and shared responsibility and involve staff in the maintenance of safe operations, rather than blame for human error. Behavior based interventions can help lower operational risks and increase the safety performance of an organization when deployed in conjunction with strong engineering and management systems. Abu Dhabi National Oil Company (ADNOC) is one of the world's largest integrated energy networks, with operations in the upstream, midstream and downstream segments in the United Arab Emirates. The company operates in high-risk facilities, including offshore platforms, gas processing plants, refineries, petrochemical complexes and pipeline facilities. Ensuring the integrity of these facilities requires adherence to internationally accepted process safety best practices, combined with an increased focus on employee engagement in safe work practices. To reach its goal of completely eliminating major process incidents and ensuring the safety of its workforce, ADNOC has made significant investments in the development of its safety leadership, digital monitoring technologies, competency development, operational excellence programs, and risk-based decision-making. Despite all these efforts, worldwide investigations of major industrial accidents have shown time and again that they more often than not are caused by more than one technical failure. Rather, accidents tend to result from a series of failures that develops over time: organizational failures, inadequate communication, failures in the procedures, failure to perceive hazards, and unsafe behaviors. As a result, process safety strategies are now a growing topic of interest in the realm of organization behavior, in addition to its role in improving behavior-based safety programs. For this reason, along with improving the effectiveness of behavior-based safety programs, process safety strategies are now a topic of great interest in the realm of organizational behavior. The relationship between technical systems and human performance is of special interest in complex industrial environments. At ADNOC, the diversity of employees and contractors within the multicultural workforce brings a variety of educational backgrounds, work experiences, and cultural attitudes towards safety to work. Such disparities bring new issues to the forefront of providing uniform compliance with safety protocols, communicating effectively during emergency situations and maintaining a unified approach to safety goals. Therefore, various factors such as leadership involvement, continuous training, good supervision and open reporting are crucial to the successful application of process safety principles and employee behaviour. A knowledge of how these factors interact can be useful when formulating ideas to enhance safety performance in different operational situations. The exploratory approach is especially suitable for this study as the interdependence of process safety strategy and behavior-based safety is a multidimensional human phenomenon within an organization that cannot be completely captured by quantitative performance indicators. The perception of employees, leadership practices, communication channels, safety culture, learning experiences and organizational experiences can be explored to gain a deeper understanding of how strategic safety initiatives affect every day workplace behaviours. These inputs may uncover strengths, missing pieces for implementation, and opportunities for improvement of the integration of technical safety system with behavioural intervention. The findings of this study will contribute to the knowledge in area of industrial safety management, by investigating the relationship between process safety strategy and behavior based safety in the operational environment of ADNOC, Abu Dhabi, UAE. The study will also provide practical recommendations to increase employee engagement, leadership engagement, communication of safety, and the development of a safety culture that will establish a safe environment to prevent a workplace injury or large scale process incident. In conclusion, the development of these relationships can help continue to drive the industry's safety excellence and uphold ADNOC's goal of sustainable, reliable and world-class operational performance.

3. Justification

In the oil and gas sector, high-risk processes, hazardous materials, and complex operational systems require thorough management of safety to ensure operations are conducted safely. Although substantial efforts have been made by organisations to invest in engineering controls, regulatory compliance and occupational safety programmes,

significant industrial incidents remain showing that operational risk remains a possibility despite the various technical measures implemented. Today, human behavior, decision-making and following certain safety procedures are still important factors in process safety performance. This has led to the development of research topic on integrating Process Safety Strategy with Behavior-Based Safety (BBS) to improve the overall safety culture of an organization. As one of the world's largest energy firms, ADNOC has broad upstream, midstream, and downstream activities, and needs a complete strategy for risk prevention and operational excellence. Process safety management systems are well known to the industry, but there has been little empirical evidence that strategic process safety initiatives can impact employee safety behaviour, compliance, hazard identification and proactive hazard reporting in the operational environment of ADNOC, Abu Dhabi. This gap indicates that a research investigation needs to be conducted to record practical experiences and organizational views on an interaction between process safety strategies and behaviour based safety practices. The present study is warranted because it aims to understand the influence of process safety strategies on employees' safety attitudes, accountability, communication and compliance of their behavior in high-risk industrial process. A study of these relations could be informative with respect to what will help to foster a disciplined working environment, promote safe work practices and minimize the risk of process-related incidents from occurring. The results will help to optimize current safety systems by combining behavioral interventions with PSM systems, which will benefit managers, safety professionals and policymakers. Moreover, the study adds to the general knowledge in the field of industrial safety by investigating the human aspects of process safety in the energy sector in the United Arab Emirates. The outcomes can help drive improved training, leadership, safety communication and continuous improvement practices to help sustain a proactive safety culture. The research can inform improvement opportunities between the process safety strategy and employee behavior, providing practical recommendations for enhancing organization resilience, operating reliability and maximizing sustainable outcomes of safety within ADNOC and other high-hazard facilities.

4. Objectives of the Study

1. To discuss current process safety strategies adopted within ADNOC and how they contribute at preventing process related incidents.
2. To study the possibility of integrating behaviour based safety (BBS) practices into the process safety management systems of the operational facilities in ADNOC.
3. To determine the behavioral factors that can affect an employee's adherence to process safety procedures and organizational safety policies.
4. To examine employees and supervisors' attitudes on the effectiveness of process safety strategies for a proactive safety culture.
5. To measure the impact of leadership commitment, safety communication and employee involvement in the effective implementation of behavior-based safety programs.

5. Literature Review

The catastrophic consequences of process failures have placed process safety at the top of the priorities for the oil and gas industry. While the main concern of occupational safety is to prevent injury to individuals, process safety is intended to prevent major accidents where hazardous materials and equipment failure and operational deviations are the cause. Organizations that embed process safety into their corporate strategy are found to be more operationally reliable and have fewer incidents, based on Hopkins' 2012 work. Likewise, CCPS (2007) pointed out that the key elements of good process safety management (PSM) that will help prevent catastrophic events are through leadership commitment, risk identification, continuous monitoring, and organizational learning. Behavior Based Safety (BBS) has proven to be an effective method for enhancing safety performance by promoting safe behaviors and reducing unsafe behaviors. Geller (2001) suggested that a large portion of workplace accidents is determined by human behavior and that positive reinforcement, employee involvement, and ongoing feedback have a positive impact on compliance with safety procedures. This idea was elaborated on by Krause (2005), who reported that in organizations that had implemented a BBS, measurable reductions in work injuries have been observed, and interventions based on the system of observation of behavior have been effective. It is becoming well known that without a comprehensive process safety strategy, behavior is not enough to avoid large-scale process safety events. The Swiss Cheese Model is a model introduced by Reason (1997) to explain why accidents happen because of numerous organizational weaknesses, instead of a single unsafe act. This systems based approach implies that BBS should not be viewed as a substitute for engineering controls, safety management systems, or organizational governance. Leadership commitment is always a top factor found to make a significant difference in the performance of process safety. Cooper (2000) suggested that the components of a positive safety culture are: management's visible commitment to safety, communicated through its messaging, allocation of resources, accountability, and employee involvement. Similarly, Hudson (2007) defined a mature safety culture as a culture where leadership actively supports hazard reporting,

learning and proactive risk management. High-risk industries have been paying a lot of attention to the safety culture/process safety link. Guldenmund (2000) defined safety culture as common organizational beliefs, attitudes, and practices that shape employees' choices in safety. A good safety culture fosters adherence to procedures and a sense of personal responsibility for hazard avoidance. Safety culture plays a major role in the oil and gas industry when it comes to operational discipline and critical safety procedures. In the context of Behavior Based Safety, employee engagement is an important factor in maintaining long-term improvements in safety. According to DePasquale et al. (1998), some critical factors for the successful implementation of BBS are the active involvement of employees, management support, peer observations, and feedback systems that are constructive. They concluded that behavioural observations are more likely to be effective when they are seen as a learning opportunity, not a disciplinary measure. The constraints of the traditional BBS programs have also been studied. Excess focus on individual behavior might lead away from organizational shortcomings, engineering failures and poor risk management systems that give rise to catastrophic process incidents, according to Hopkins (2006). In this way, contemporary safety principles promote the integration of engineering safety controls, systematic risk management, and behavioral interventions. The Center for Chemical Process Safety has stressed that the aim of process safety management should be to include hazard identification, risk assessment, mechanical integrity, management of change, incident investigation, emergency preparedness and continuous process improvement. There are potentially significant advantages in having these elements as part of strategic decision-making in an organization, as noted by CCPS (2011). The process safety strategy (PSS) is a process that has developed from being compliance-driven to proactive risk management. Mannan (2014) pointed out that process safety strategies involving engineering controls, organizational leadership, human factors, operational discipline and continuous monitoring are essential to reduce process hazards. This type of system ensures technical reliability and human performance are mutually reinforcing instead of mutually exclusive. In complex industrial settings, human factors remain a key factor in process safety outcomes. Dekker (2014) suggested that human error is a result of weaknesses in the system of the organization, and not the only reason for an accident. This approach can foster the integration of Behavior Based Safety into a broader organizational learning, leadership accountability, and resilient safety system. The safety climate has been investigated as a predictor of process safety performance in the Middle East by several studies. Al Mazrouei et al. (2019) concluded that the UAE oil-refining industry's process safety performance is positively related to the three factors of management commitment, supervisory safety behavior, and employee engagement. They found that companies with more favourable safety climates indicated that they had higher levels of employee involvement in safety activities and in safer workplaces. Process safety in the ADNOC operating context is now a fundamental principle embedded in organizational governance and is a key strategic priority. ADNOC has developed a detailed Asset Integrity and Process Safety Management framework which encompasses leadership, process discipline, risk management, independent assurance review and continuous improvement. The organisation's "100% HSE" approach has a focus on behavioural safety and process safety and aims to embed safe work practices alongside the strength of asset integrity throughout the life cycle. The industry's recent evidence also shows that ADNOC has increasingly introduced process safety barriers via systematic asset integrity, predictive maintenance, risk-based inspections, operational readiness reviews and independent process safety assurance. These efforts are designed to minimize process safety-related incidents and to create a culture that encourages workers to be proactive in their risk assessment and risk reduction efforts. Behavior Based Safety has continued to grow into more than just observation programs. Spigener et al. (2022) claimed that modern BBS is not just about employee behaviors but also incorporates elements of behavioral science, organizational learning, leadership engagement, and system reliability. This change is a reflection of modern day process safety thinking, where the culture, the engineering controls, and the people who work within the engineering controls all influence one another. There is a good correlation between the literature of process safety strategy, leadership commitment, safety culture and BBS in general. While there are a few qualitative studies that explicitly study perceptions of the interrelationship between strategic process safety efforts and behavioral efforts for safety, there are few such studies relative to comparative numbers. This gap has identified the need for an exploratory qualitative study to understand how the use of process safety strategies affect employee behaviour, safety culture and operational excellence in ADNOC Abu Dhabi UAE.

6. Material and Methodology

This study was conducted using a qualitative exploratory methodology and examined the role of process safety strategy in the enhancement of the process of strengthening Behavior Based Safety (BBS) for ADNOC (Abu Dhabi National Oil Company) in this context. This exploratory design was selected as it would enable organisations to be fully understood with regards to the strategies being employed to ensure safety, employee perceptions of safety, and leadership behaviours which influence the behaviour of employees in a high risk workplace. The study explored the relationship between process safety management systems and workers' safety actions, and organizational elements that contribute to a pro-active safety culture. Primary data collected were through semi-structured in-depth interviews

with professionals who work in different management levels of ADNOC, including process engineers, HSE manager, operations supervisor, maintenance and safety officers. The respondents were selected through purposive sampling, where participants had considerable experience in process safety management and behavior-based safety implementation. Interviews went on until thematic saturation was reached ($n = 20-25$), where no further significant new information emerged from subsequent interviews. The interview guide included open-ended questions focused on the process safety leadership, hazard identification, risk assessment, employee participation, safety communication, reporting culture, behavioural observations, learning from incidents, competency development and continuous improvement initiatives. Interviews took place via secure, virtual platforms or in person between participants and their interviewers, and each ended after 45 to 60 minutes. Interviews were audio-recorded with participant consent, and then transcribed verbatim to ensure accurate transcription. Secondary sources were consulted to give context and complement the interview data as well as to support data triangulation. These included ADNOC safety manuals, publicly available HSE guidelines, process safety standards from the international community, industry reports, regulatory documents, as well as peer-reviewed journals articles on process safety management, behavioral safety, organizational safety culture and high reliability organizations. The findings were more credible and rich because of the use of multiple data sources. Thematic analysis was used to analyse the qualitative data obtained. Transcripts of the interviews were read over again and again to become familiar with the data. Analogous codes were placed under general codes that would reflect common patterns related to process safety strategy and behavior-based safety and meaningful statements were coded systematically. These were further broken down into themes of leadership commitment, process hazard awareness, employee engagement, safety communication, learning from incidents, risk perception and organisational resilience. Themes were synthesized by making connections with process safety and organizational behaviour theories and frameworks that were already in existence. A number of quality assurance steps were taken to assure the trustworthiness of the research. Member validation was used to lend credibility and helped to ensure that the summaries of the interview responses were accurate. Good documentation of research process and coding procedures was used to assist with dependability. Triangulation with multiple data sources and systematic records of analytical decisions were used to achieve confirmability. As for transferability, description of the organizational setting, characteristics of the participants and research method enabled the reader to assess the generalizability of the findings to a similar industrial context. A strict adherence to ethics was ensured in the study. There was no coercion in participation and informed consent was obtained from all the respondents before the data collection process began. Participants were assured that their names and details pertaining to their organisations would be kept confidential and data gathered from interviews would be anonymised when transcribed and analysed. The research adhered to accepted social science research principles in terms of privacy, secure data collection, voluntary participation, and right of withdrawal from the research at any time without harm. This methodology provides a good basis for investigating the effects of process safety strategies on the implementation of behavior-based safety strategies and how they contribute to a sustainable culture of safety in the ADNOC operating context.

7. Results and Discussion

Results:

This is the exploratory qualitative study that was carried out to gain insight into how process safety strategy contributes to improving the Behavior Based Safety (BBS) practices in the operational environment of Abu Dhabi, UAE, in the context of Abu Dhabi National Oil Company (ADNOC). The semi-structured interviews were carried out with employees from operations, maintenance, engineering, HSE and supervisory tasks. Thematic analysis showed that process safety strategies have a significant impact on employee safety behaviour, organizational learning, leadership involvement and operational reliability. The four themes that were identified through the analysis of the data were: Leadership commitment to process safety, integration of BBS into operational activities, barriers to implementing BBS, and outcomes of the combination of process safety and behavioral interventions.

Table 1: Participant Profile

Participant Category	Number of Participants	Percentage (%)
Operations Personnel	8	26.7
Maintenance Staff	6	20.0
Process Engineers	5	16.7
HSE Professionals	6	20.0
Supervisors/Managers	5	16.6
Total	30	100.0

Discussion

A participant profile is presented which shows representation across all operational functions, providing a variety of views on process safety and behavioral safety practices. The largest group of participants included operations personnel as they are directly involved with process equipment and hazardous operations. Professionals and supervisors from HSE spoke about their management viewpoints relating to the implementation of the policy and monitoring for compliance, while maintenance and engineering personnel discussed their technical viewpoints regarding equipment integrity and hazard prevention. The multi-disciplinary representation enabled the findings to be seen as credible as it included experiences at different levels of organisations.

Table 2: Major Themes Identified During Thematic Analysis

Theme	Frequency (n = 30)	Percentage of Participants (%)
Leadership Commitment to Process Safety	27	90.0
Integration of Process Safety with BBS	25	83.3
Employee Participation and Safety Communication	24	80.0
Continuous Learning and Incident Reporting	22	73.3
Risk Awareness and Hazard Identification	26	86.7

Discussion

One theme that was raised more than any other was about leadership commitment. Participants expressed that visible management involvement, regular safety checks, and regular communication had a positive impact on employee safety behavior. Another key point was on risk awareness as respondents commented on the systematic hazard identification and process hazard analysis helping to encourage proactive safety practices. Linking BBS to process safety efforts allowed for more accountability for workers by linking behavioral observations with technical risk controls. Staff also highlighted the positive influence open communication and non-punitive reporting systems have on the improvement of the organisation's learning and the reduction of risk of repeat safety incidents.

Table 3: Perceived Challenges in Implementing Process Safety Strategies

Challenge	Participants Reporting (n = 30)	Percentage (%)
Resistance to Behavioral Change	19	63.3
Communication Gaps Across Departments	17	56.7
Inconsistent Safety Observation Practices	15	50.0
Workload and Production Pressure	21	70.0
Limited Continuous Refresher Training	18	60.0

Discussion

The most common theme that was found in the discussion was leadership commitment. The participants stated that they felt visible management involvement, regular safety checks and regular communication had a positive effect on employee safety behavior. Another theme that was prominent was risk awareness, with respondents noting that a proactive attitude to safety is promoted through systematic hazard identification and process hazard analysis. The BBS integration with process safety provided enhanced accountability among employees through the connection of behavioral observations to technical risk controls. Employees also mentioned the need for open communication and non-punitive reporting processes to foster greater organizational learning and diminish the likelihood of repeat safety incidents.

Table 4: Perceived Organizational Benefits of Integrating Process Safety Strategy with Behavior-Based Safety

Organizational Outcome	Participants Reporting (n = 30)	Percentage (%)
Improved Safety Culture	28	93.3
Better Hazard Recognition	27	90.0
Increased Employee Accountability	25	83.3
Reduction in Unsafe Behaviors	24	80.0
Enhanced Operational Reliability	26	86.7
Greater Organizational Learning	23	76.7

Discussion

The results show that the implementation of process safety strategy along with BBS can significantly add value to organizational performance. The majority of the participants felt that the overall safety culture had improved and that more was now being openly discussed, accounted for and reported proactively. Staffing with enhanced hazard recognition allowed staff to anticipate process deviations before an incident could happen. In addition, respondents noted that engineering controls plus behavioral interventions led to a decrease in unsafe practices and an increase in operational reliability. Preventive safety practices were reinforced by continuous organizational learning, which was supported by incident investigations, safety observations and feedback mechanisms, and ensured that employee competence was enhanced.

8. Conclusion

This study was an exploratory study on how process safety strategy can enhance the practice of Behavior-Based Safety (BBS) in the operational context of ADNOC, Abu Dhabi, UAE. The results show that process safety and behavioral safety are not independent or mutually exclusive ways to manage risks. The core of Process Safety is on the control of major hazards in the engineering design, operational discipline, asset integrity and systematic risk management, while Behavior Based Safety is about safe actions, individual accountability and reinforcement of positive safety behaviors on a continual basis. The two will form a more resilient, proactive safety management system that will prevent occupational incidents and larger process-related events. The study shows that a process safety strategy is more than just following regulations and technical standards. Leadership commitment, clear communication, employee involvement, continuous learning and a strong culture of reporting are all crucial to the success of the process safety, as well as behavioral interventions. Having the knowledge of the relationships between staff actions and process safety barriers will increase the likelihood of good operating practices, hazard awareness and involvement in organizational learning. In the same way, continued involvement, recognition and coaching from management fosters trust and promotes active involvement and participation in a safety program. Additionally, the exploratory analysis shows that an integrated systems approach – incorporating behavioral safety into existing process safety systems – is beneficial to organizations in higher hazard industries, such as oil and gas. Improved safety programmes, including through frequent training, competency development, incident investigations (with a systemic learning approach), monitoring using data collection of leading safety indicators. This integration adds to the robustness of the system with respect to reliability, reduces human error and allows for ongoing enhancements in safety outcomes. For ADNOC Abu Dhabi, operational excellence and risk management are of utmost importance, and the incorporation of process safety strategies and BBS can contribute to fostering a stronger safety culture and promoting resilience within the organization. A workplace that everyone is consistently looking for safety hazards, safe operating procedures, and is involved in the decision-making process for workplace safety is a workplace that is less likely to be plagued with accidents and maintain consistent operations. The findings from this research give interesting explorative knowledge but cannot be applied or extended beyond the participants and organizational context of this study. Future studies may include additional companies, mixed methods, and/or longitudinal studies to further validate the relationship between process safety strategy, behavioral safety practices, and organizational safety outcomes. Finally, process safety strategy is a key component to supporting Behavior-Based Safety by integrating technical controls, human behavior, and leadership commitment and organizational learning. Companies that will be able to reach these elements successfully will have more opportunities to achieve sustainable safety excellence, to minimize risks to their operation and to develop a safety culture that makes safety a shared responsibility and a value in the company.

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