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# Analysis Of Occupational Safety Implementation Aboard The AHTS MP. Prowess In Support Of Pipeline Operations At The Chevron Oil Field, Thailand

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**Abstract**

*This study analyzes the implementation of occupational safety aboard the AHTS MP. PROWESS in supporting pipeline operations at Chevron Oil Field Thailand. Maritime pipeline operations involve considerable risks, including fluid leakage, fire and explosion, lifting and material handling hazards, confined spaces, adverse weather, vessel position deviation, and worker fatigue. This study employed a descriptive qualitative approach to obtain an in-depth understanding of safety practices from the perspectives and experiences of personnel directly involved in vessel operations. Data were collected through observation, interviews, and documentation and analyzed using the Miles and Huberman model, consisting of data reduction, data display, and conclusion drawing and verification. The findings indicate that occupational safety is implemented through Standard Operating Procedures (SOP), Permit to Work, Toolbox Meetings, Job Safety Analysis/Hazard Identification, Risk Assessment and Risk Control (JSA/HIRARC), Personal Protective Equipment (PPE), equipment inspections, and emergency response procedures. Their effectiveness is strongly influenced by leadership commitment, crew competence, communication, discipline, and active participation in reporting unsafe conditions and near misses. The study concludes that an integrated safety management system, supported by continuous training, monitoring, evaluation, and a strong safety culture, is essential for minimizing occupational risks and improving the safety and sustainability of offshore pipeline operations.*

**Keywords: AHTS MP. Prowess, Occupational Safety, Pipeline Operations, Risk Management, Safety Culture.**



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## INTRODUCTION

Occupational safety in the maritime industry is a crucial aspect, considering that the sector operates in a risky environment. Work at sea often involves erratic weather conditions, heavy equipment, and limited workspace (Katiga Pass, 2024). The International Maritime Organization (IMO) revealed that accidents on fishing boats are caused by various factors, with the percentage of human error reaching 43.06%, natural factors 33.57%, and technical factors 23.35%. Human factor is the main cause of accidents at sea that lead to death. In addition, marine transportation operators and other related institutions still pay little attention to this, and safety equipment at sea is inadequate (Adam et al., 2023).

One of the reasons why occupational safety is so important in the maritime industry is its direct impact on the health and safety of workers. An accident that occurs can not only harm the individuals involved, but it can also affect co-workers and the company's operations as a whole. When a worker has an accident, it can lead to disruptions in the work process, project delays, and additional costs for medical care and compensation. Therefore, the implementation of strict safety standards and adequate training for workers is essential to prevent adverse incidents (Surjaman, 2024).

The relevance of pipeline work on ships is also very high in the context of work safety. This job involves the installation, maintenance, and operation of pipeline systems used to transport different types of fluids, including fuel, water, and chemicals. A poorly managed plumbing system can lead to leaks, potentially leading to fires or environmental pollution. Pipeline leaks on ships can cause significant economic losses and serious environmental impacts, thus emphasizing the importance of safety in pipeline work (Rindraputra et al., 2024).

In this context, an understanding of the risks associated with pipeline work is essential. Workers involved in the installation and maintenance of pipeline systems must be equipped with knowledge of potential hazards and how to control them. Comprehensive safety training, which includes emergency procedures and the use of personal protective equipment (PPE), should be an integral part of the training program for workers in the sector. This will help reduce the likelihood of accidents and raise awareness of the importance of workplace safety.

From a management perspective, the implementation of an effective occupational safety policy also plays an important role in increasing productivity and operational efficiency. Companies that invest time and resources in good safety programs tend to experience fewer incidents, which in turn reduces accident-related costs. Companies


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that implement a good safety management system can improve overall performance and reduce operational costs. This shows that occupational safety is not only a moral responsibility, but also a smart business decision (Saputra, 2021).

In addition, international regulations and standards, such as those set by the IMO and the Occupational Safety and Health Administration (OSHA), provide a clear framework for safety practices in the maritime industry. Compliance with these standards not only protects workers, but also assists companies in fulfilling legal obligations and maintaining their reputation in the market. The implementation of good safety standards can also be a competitive advantage, as clients and other stakeholders are increasingly paying attention to the safety aspect in choosing a business partner.

The importance of occupational safety in the maritime industry, especially in pipeline work, cannot be underestimated. By understanding the risks associated and implementing appropriate preventive measures, companies can create a safer and more productive work environment. Further research and analysis of occupational safety practices in this sector is urgently needed to continue to improve safety standards and reduce the number of accidents in the maritime industry.

The AHTS (Anchor Handling Tug Supply) vessel MP. PROWESS—a type of ship utilized in maritime operations—plays a vital role in supporting oil and gas drilling activities and transporting materials and equipment to hard-to-reach locations (Hakim, 2020). However, this role entails significant risks for both the crew and the surrounding environment. In this context, workplace safety is not merely a corporate responsibility but also a moral obligation to protect every individual involved in these operations.

The AHTS vessel MP. PROWESS operates in a challenging environment characterized by unpredictable weather, high waves, and limited workspace. These factors contribute to the potential for accidents and incidents that could jeopardize crew safety. Consequently, the implementation of rigorous and systematic safety procedures is essential to mitigate these risks. In this context, it is crucial to recognize that workplace safety goes beyond mere regulatory compliance; it also entails fostering a strong safety culture among all team members.

According to reports from the International Maritime Organization (IMO), the maritime industry has one of the highest accident rates compared to other sectors. Incidents are often fatal and can result in significant financial and reputational losses for the company. Therefore, this study aims to analyze the implementation of occupational safety measures during pipeline operations on the AHTS vessel MP. PROWESS, focusing on the procedures applied, risk identification, and mitigation measures taken.


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Pipeline operations on the AHTS vessel MP. PROWESS are of critical importance regarding workplace safety. Piping systems are used to transport various types of fluids—including fuel, water, and chemicals—each presenting its own potential risks. Leaks or damage to these systems can lead to serious incidents, such as fires, environmental pollution, and even fatalities. Research by Chen et al. (2022) indicates that pipeline leaks on ships can result in significant economic losses and severe environmental impacts, thereby underscoring the importance of safety in pipeline operations.

The challenges involved in pipeline work aboard the AHTS MP. PROWESS include the welding, installation, and maintenance of piping systems. These processes require in-depth skills and knowledge, as well as an understanding of potential hazards. Furthermore, the confined workspace on board can make it difficult for workers to perform their tasks safely. Therefore, it is crucial to identify the risks associated with pipeline work and implement effective mitigation measures.

In this context, the implementation of rigorous safety procedures and adequate worker training is crucial. Well-trained workers are better equipped to identify hazards and take necessary preventive measures. Furthermore, involving workers in the development and implementation of safety procedures can enhance the effectiveness of the measures adopted. Thus, prioritizing workplace safety during pipeline operations on the AHTS vessel MP. PROWESS will not only protect workers but also improve operational performance and reduce the risk of future accidents.

## LITERATURE REVIEW

### Occupational Safety Implementation

Implementation is the process of implementing a plan, concept, or program that has been systematically prepared to achieve the goals that have been set. This stage is an important part because it turns conceptual planning into concrete actions in the implementation of activities. Fullan explained that implementation is the process of implementing new ideas, programs, or a series of activities in the hope that it will be accepted and encourage change in the targeted party (Majid, 2014). Thus, implementation is not only oriented to the implementation of activities, but also includes the process of translating decisions into actions that can result in gradual changes. In the context of occupational safety, implementation can be understood as a real effort to implement various safety policies, procedures, and programs so that they can be implemented consistently in daily work activities.



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In line with this view, Kelly et al. (2022) stated that Implementation is the process of translating policies, programs, or plans that have been set into concrete actions to achieve the expected goals. The implementation process is not only related to the implementation of activities, but also includes the use of strategies, resources, coordination, and the involvement of the parties responsible for running the program. The success of implementation is greatly influenced by the organization's ability to connect the planned objectives with the practices carried out in the field. Thus, implementation is an important stage to ensure that a plan does not stop at the conceptual level, but is realized into actions and results that can be evaluated. Therefore, implementation cannot be seen as a purely administrative activity, but is a dynamic process that requires coordination, commitment, and adjustment to the situation at hand. In the implementation of occupational safety, the process is important to ensure that safety provisions are truly embodied in work behaviors and practices that are able to protect every worker.

The success of implementation is influenced by various factors related to the characteristics of the problem, policies, and the environment of its implementation. Mazmanian and Sabatier explained that there are three main groups of factors, namely the characteristics of the problem (tractability of the problem), the ability of policy in structuring implementation (the ability of statute to structure implementation), and environmental variables that affect the implementation process (in Kharima & Nawangsari, 2024). The characteristics of the problem are related to the level of technical difficulty faced, while the characteristics of the policy include the clarity of the objectives, the substance of the policy, and the accuracy of the institution responsible for implementing it. Meanwhile, the implementation environment includes socio-economic conditions, technological developments, community support or related groups, as well as the commitment and ability of officials and policy implementers (Kharima & Nawangsari, 2024). In occupational safety, these three factors are interrelated because the effectiveness of the implementation of safety policies is not only determined by the quality of the rules, but also by the readiness of resources and the environmental conditions in which the policy is implemented.

This view is strengthened by Weimer and Vining (2017) who stated that the success of program implementation is influenced by three main variables, namely policy logic, policy environment, and the ability of policy implementers. Policy logic shows the extent to which a policy has a rational relationship between problems, actions taken, and goals to be achieved. The policy environment describes various external conditions that


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can support or hinder the implementation of the program, while the ability of the implementer is related to the competence, resources, commitment, and capacity of the party implementing the policy. In the implementation of occupational safety, these three aspects are necessary so that policies do not stop at written provisions, but can be applied effectively in operational activities. Thus, optimal implementation of occupational safety requires clear and rational policies, a supportive work environment, and implementers who have high competence and commitment to safety (Weimer & Vining, 2017).

**Workplace Safety Concepts**

Workplace safety entails a series of systematic efforts to protect the health, safety, and well-being of workers by creating a safe work environment and controlling various potential hazards. Goetsch (2019) explains that workplace safety encompasses the processes of hazard identification, risk assessment, and the implementation of preventive measures to minimize the likelihood of accidents. In the maritime industry, this aspect is particularly critical as workers face unpredictable weather conditions, confined workspaces, the use of heavy equipment, and various physical, chemical, and ergonomic risks. These conditions result in a relatively high risk of accidents within the maritime sector, which can lead to serious consequences for both worker safety and vessel operations (IMO, 2021). Heinrich et al. (2020) emphasize that accident prevention requires hazard control, adequate training, and the use of personal protective equipment (PPE) appropriate to the nature of the work. Thus, workplace safety constitutes a vital part of a company's legal and moral responsibility to create a maritime work environment that is safe, healthy, and productive.

Occupational safety principles fundamentally position hazard identification and risk assessment as the initial steps in preventing accidents. Hazard identification is essential for recognizing various sources of risk, while risk assessment helps determine the likelihood and potential severity of impacts, enabling the appropriate prioritization of control measures (Goetsch, 2019; Heinrich et al., 2020). Once risks are identified, controls can be implemented—such as adopting safer work methods, substituting hazardous materials, establishing work procedures, and using appropriate personal protective equipment (PPE)—to minimize the potential for accidents (Geller et al., 2012). Beyond technical controls, continuous safety training and education are necessary to enhance workers' knowledge, skills, and awareness regarding workplace hazards (Zohar, 1980). Worker involvement is also crucial; participation in the development and


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implementation of safety procedures can improve compliance and encourage workers to be more proactive in reporting potential hazards (Ali et al., 2023). Therefore, workplace safety must be established through an integrated approach that combines risk control, competency development, and the active participation of all workers.

The implementation of occupational safety in the maritime sector is supported by both international and national regulations and standards that serve as guidelines for shipping operations. At the international level, the International Maritime Organization (IMO) established the International Convention for the Safety of Life at Sea (SOLAS), which sets minimum safety standards for ships—covering construction, safety equipment, and various operational provisions—to mitigate the risk of accidents at sea (IMO, 2021). In addition to SOLAS, the International Safety Management (ISM) Code provides a framework for shipping companies to establish safety management systems through hazard identification, risk assessment, control measures, and the consistent fostering of a safety culture (Goetsch, 2019). In Indonesia, occupational safety is legally grounded in Law Number 1 of 1970 concerning Occupational Safety, which mandates the provision of a safe and healthy working environment, including within the maritime sector (Simatupang, 2016). National shipping regulations further reinforce the enforcement of requirements regarding ship safety, safety equipment, crew competence, and adherence to applicable operational procedures. Consequently, compliance with safety regulations and standards is an integral part of protecting workers while simultaneously supporting the sustainability and reliability of vessel operations.

Various studies indicate that occupational safety success in the shipping industry is influenced by the quality of safety management systems, worker competence, communication, and the involvement of the entire crew. Hsiao et al. (2022) found that implementing a structured safety management system, accompanied by training and enhanced crew awareness, contributes to a reduction in onboard accident rates. Similarly, Zhang and Wang (2023) demonstrated that limited training and poor crew communication can increase accident risks, highlighting the need for comprehensive training on safety procedures and the use of personal protective equipment (PPE). Regarding pipeline operations, Chen et al. (2022) emphasized thalie importance of hazard identification, risk assessment, rigorous safety procedures, and monitoring technologies to prevent leaks that could potentially cause fires or environmental pollution. Meanwhile, Ali et al. (2023). found that involving workers in the development and implementation of safety procedures can boost their safety awareness and ability to


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proactively identify potential hazards. Based on these findings, achieving effective occupational safety in the maritime industry requires integrating safety management systems, risk controls, worker competence, effective communication, supporting technologies, and the active participation of all vessel personnel.

## RESEARCH METHODOLOGY

This study employs a qualitative descriptive approach to gain an in-depth understanding of the implementation of workplace safety measures during pipeline operations on the AHTS MP. PROWESS. This approach is used to describe the phenomenon based on the experiences and perspectives of the subjects directly involved in operational activities. Through a qualitative descriptive approach, the study provides a systematic overview of the processes, actions, and outcomes associated with implementing workplace safety in pipeline operations. Furthermore, this approach enables the researcher to understand naturally occurring conditions without isolating them from the context of the vessel's working environment. This aligns with Sugiyono (2022), who explains that qualitative research is used to understand phenomena in depth based on natural conditions and the perspectives of the research subjects.

A qualitative approach is employed in this study to understand how occupational safety analysis is applied during pipeline operations and how the vessel's crew responds to its implementation. The study also seeks to identify factors that facilitate or hinder the successful implementation of occupational safety, encompassing human resources, work procedures, and operational conditions. Furthermore, this approach is used to describe the specific characteristics of the work environment aboard the AHTS MP PROWESS, including safety culture, company policies, crew coordination, and technological infrastructure support. Understanding these aspects is essential for gaining a comprehensive overview of occupational safety practices under actual operational conditions. Consequently, the qualitative descriptive approach is expected to yield a contextual and in-depth analysis of occupational safety implementation during pipeline operations on the AHTS MP PROWESS.

This study uses Miles and Huberman's qualitative data analysis techniques which are carried out interactively and continuously during the research process, including data reduction, data presentation, and conclusion drawing and verification (Sugiyono, 2022). Data reduction is carried out by selecting, focusing, and grouping relevant data, then the data is presented systematically to facilitate the identification of patterns, relationships, and research themes. Furthermore, the researcher draws conclusions based on the


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findings obtained and re-verifies the data to ensure that the interpretation results are supported by adequate evidence. With these stages, the analysis process is expected to produce findings that are systematic, in-depth, and in accordance with empirical conditions in the field.

## RESULT

### Safety Procedures Implemented and Their Effectiveness

The implementation of workplace safety for pipeline operations aboard the AHTS MP. PROWESS involves an interconnected process comprising procedures, personnel, equipment, communication, and supervision. Safety practices are demonstrated through the execution of Standard Operating Procedures (SOPs), Permit-to-Work systems, and Toolbox Meetings—both prior to and during operations. SOPs serve as guidelines ensuring that each work stage is conducted systematically and in compliance with safety standards, while the Permit-to-Work system ensures that high-risk tasks are authorized and meet necessary control requirements. Meanwhile, Toolbox Meetings facilitate communication to align understanding regarding the work, potential hazards, the allocation of responsibilities, and preventive measures before activities commence. These aspects demonstrate that safety effectiveness relies not merely on the existence of written procedures, but also on consistent implementation, crew competence, inter-departmental communication, and supervision by the vessel's leadership.

Other aspects that play an important role are the implementation of Job Safety Analysis (JSA)/Hazard Identification, Risk Assessment and Risk Control (HIRARC) and the use of Personal Protective Equipment (PPE). JSA/HIRARC helps crews identify potential hazards, determine risk levels, and establish appropriate control measures before pipeline work is carried out. The use of PPE is then a form of direct protection against the risks that still remain after various technical and administrative controls are implemented. The findings show that safety management needs to be carried out in an integrated manner through hazard identification, risk assessment, implementation of hierarchy of control, compliance with procedures, and increased safety awareness of all crews.

In addition to preventive measures, the Emergency Response Plan is an important part of ensuring ship's readiness to deal with emergencies that may arise during pipeline work. The effectiveness of an emergency response plan is greatly influenced by the clarity of procedures, equipment readiness, crew competence, inter-section coordination, and the ability of personnel to respond quickly and appropriately.


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Overall, the findings of the study show that SOP, Permit to Work, Toolbox Meeting, JSA/HIRARC, the use of PPE, and Emergency Response Plan form a unit in the safety management system for pipeline work on AHTS MP ships. PROWESS. Therefore, the effectiveness of the implementation of occupational safety needs to be strengthened through monitoring, training, periodic evaluation, and the formation of a safety culture that involves the entire crew of the ship.

**Key Risks of Pipeline Work and Mitigation Measures**

The identification results show that the pipeline work on the AHTS MP. PROWESS has risks originating from mechanical aspects, fire and explosion, as well as human factors. Mechanical risks are related to the use of cranes, hydraulic tools, welding equipment, and cutting tools which can cause workers to be crushed, hit by material, or suffer injuries due to work equipment. Meanwhile, the potential for fuel leaks, sparks during welding, and gas accumulation can increase the risk of fire or explosion during work. Control is carried out through equipment inspections, use of competent operators, gas tests, hot work permits, fire watches, provision of extinguishers, and implementation of safe work procedures.

In addition to technical risks, human factors are an important part that affects the level of safety in pipeline work. The results of the interviews show that fatigue, lack of communication, low discipline, and a tendency to work in a hurry can increase the likelihood of mistakes and work accidents. This condition is increasingly important to consider because the work is carried out in a dynamic offshore environment and requires optimal concentration, coordination, and physical readiness of the crew. Therefore, the safety culture needs to be strengthened through effective communication, adherence to procedures, the regulation of work and rest times, and consistent supervision from the ship's leadership.

Data analysis uses the Miles and Huberman model through the stages of data reduction, data presentation, and drawing and verifying conclusions based on observation, interviews, and documentation. The results of the analysis identified a number of main risks, namely pipeline or fluid leaks, fires and explosions, lifting and material handling, work in confined spaces, bad weather and ship position deviations, and work fatigue. These risks indicate that pipeline work safety is not only affected by equipment conditions, but also procedural readiness, crew competence, interdepartmental communication, environmental conditions, and quality of supervision.


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Thus, every risk requires regular monitoring, training, and evaluation so that mitigation measures remain in accordance with the ship's operational conditions.

Overall, the research findings indicate that the management of pipeline-related work risks must be integrated into the safety management system of the AHTS vessel MP. PROWESS. Workplace accidents typically arise from the interaction of various factors—ranging from personnel, procedures, equipment, and the work environment to organizational aspects—meaning that control cannot be achieved through a single preventive measure alone. A "hierarchy of controls" approach, combined with HIRARC/JSA, is essential for identifying hazards, assessing risk levels, prioritizing controls, and continuously evaluating the effectiveness of mitigation measures. Consequently, enhancing crew competence, ensuring equipment suitability, maintaining procedural discipline, fostering effective communication, and strengthening the safety culture are crucial elements in minimizing pipeline work risks in the offshore environment.

**Employee Safety and Compliance Culture**

Research findings indicate that the safety culture regarding pipeline operations on the AHTS MP. PROWESS is built upon the involvement and responsibility of the entire crew, aligned with their respective roles. The Captain acts as the safety leader, ensuring the implementation of Standard Operating Procedures (SOPs), making safety-related decisions, and exercising the authority to halt operations if hazardous conditions arise. Deck officers are responsible for supervising work, maintaining effective communication, and ensuring the crew correctly follows procedures, while technicians and operators ensure equipment suitability through inspections and damage reporting. Safety personnel also support work area monitoring and emergency preparedness, making safety a shared responsibility rather than the duty of specific individuals alone.

The results of the analysis show that the commitment of the ship leader, safety communication, near miss reporting, officer example, routine training, and Stop Work Authority are important elements that support the safety of pipeline work. All of these elements are interrelated in forming work behavior that is more disciplined, responsive to hazards, and oriented towards accident prevention. Leadership commitment and safety communication are an important foundation in building a consistent safety culture in the ship's environment. The captain's and officer's exemplary adherence to procedures can encourage crews to make safety a part of their work habits, while open communication allows information about potential hazards to be conveyed quickly and


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appropriately. Near miss reporting is also a means of learning because incidents that almost cause accidents can be analyzed to prevent the recurrence of similar conditions. Regular training further strengthens the crew's knowledge, skills, and readiness to deal with the risks of pipeline work taking place in a dynamic offshore environment.

The implementation of Stop Work Authority further strengthens the safety culture by empowering the crew to halt operations upon encountering unsafe conditions, without disregarding operational responsibilities. These findings demonstrate that workplace safety effectiveness is determined not only by the presence of procedures and equipment but also by the competence, communication, leadership, compliance, and safety awareness of all personnel. Within the safety management system framework, human factors, procedures, equipment, the environment, and organizational aspects must be managed in an integrated manner through HIRARC/JSA, risk control, monitoring, training, and continuous evaluation. Consequently, strengthening safety culture and crew compliance serves as a vital foundation for minimizing risk and ensuring safe, responsible pipeline operations aboard the AHTS MP PROWESS.

## DISCUSSION

### Implementation of Occupational Safety Posture on Pipeline Work

The implementation of occupational safety procedures for pipeline operations aboard the AHTS MP. PROWESS demonstrates that safety must be managed as an integrated and continuous process. This process encompasses planning, execution, supervision, and evaluation, as well as the remediation of any deficiencies identified during operations. Such an approach is crucial given that pipeline work takes place in a dynamic offshore environment characterized by relatively high risk levels. Consequently, occupational safety must be treated as a core component of every stage of the work, rather than merely a matter of fulfilling administrative obligations.

The results of the study show that the implementation of safety is supported by several main instruments, namely Standard Operating Procedures (SOP), Permit to Work, Toolbox Meeting, JSA/HIRARC, the use of Personal Protective Equipment (PPE), and work equipment inspections. The instrument serves to ensure that any potential hazards have been identified and controlled before and during the work. The implementation of JSA/HIRARC helps crews understand the level of risk and determine appropriate control measures, while Permit to Work ensures that at-risk work obtains authorization as per procedures. Thus, the effectiveness of safety is highly dependent


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on the consistency of the application of all these instruments in daily operational activities.

In addition to the procedural aspect, the human factor has a very important role in determining the success of the implementation of occupational safety. Master/Skipper leadership, officer discipline, crew competence, and interdepartmental communication are factors that determine whether safety procedures are effectively implemented. Crews also need to have the courage to convey unsafe conditions, report near misses, or stop work when there is an unacceptable risk. This condition shows that safety is not enough to be built through written rules, but must develop into a work culture that is understood and carried out jointly by all ship personnel.

Emergency preparedness is also an integral part of the implementation of safety procedures on pipeline work. Emergency Response Plan, safety equipment readiness, training, and emergency simulation are needed so that crews are able to respond quickly and appropriately when an incident occurs. Regular supervision and inspection are also required to ensure that work equipment and safety facilities are always in a suitable condition for use. Thus, the ability to prevent accidents must be balanced with the readiness of the crew to control the impact if an emergency really occurs.

Overall, the implementation of workplace safety during pipeline operations aboard the AHTS MP. PROWESS highlights the importance of integrating procedures, technology, personnel, leadership, and organizational culture. Developments in safety studies for the 2021–2026 period increasingly emphasize risk-based safety management, safety culture, human factors, and the concept of a learning organization as foundations for accident prevention in maritime and offshore environments. These approaches treat every incident, near-miss, and instance of non-compliance as a learning opportunity to continuously improve safety systems. Consequently, monitoring, evaluation, competency enhancement, and the commitment of the entire crew are crucial factors in establishing safe, effective, and sustainable pipeline operations.

**Identify Key Risks and Mitigation Effectiveness**

The identification of key risks associated with pipeline operations on the AHTS *MP Prowess* demonstrates that safety must be managed through a systematic process, spanning from initial planning to continuous improvement. The dynamic offshore work environment necessitates the identification of potential hazards prior to the commencement of work to ensure risks are effectively controlled. This process requires the integration of hazard identification, risk assessment, the implementation of


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mitigation measures, supervision, and the evaluation of control effectiveness. Consequently, risk identification serves not merely as an administrative task but as a fundamental basis for safety-related decision-making throughout the course of the work.

The results of the study show that SOP, Permit to Work, Toolbox Meeting, JSA/HIRARC, use of Personal Protective Equipment (PPE), equipment inspection, and Emergency Response Plan are the main instruments in risk mitigation. JSA/HIRARC helps crews identify hazard sources and determine risk levels, while Permit to Work ensures risky work is carried out after meeting established safety requirements. The use of PPE and equipment inspections provides protection against potential hazards related to working conditions and equipment feasibility. Meanwhile, emergency response readiness is needed to limit the impact if preventive measures are not fully able to avoid incidents.

The effectiveness of mitigation depends not only on the completeness of procedures and equipment, but also on the human and leadership factors. The Master/Skipper has a strategic role in ensuring safety policies are consistently implemented, while officers are responsible for the supervision and discipline of the crew during the job. Crew competence, effective communication, compliance with procedures, and the courage to report unsafe conditions are important elements in preventing potential hazards from developing into accidents. Therefore, the active involvement of all personnel is necessary so that mitigation measures can be implemented in accordance with actual operational conditions.

The identification of key risks associated with pipeline operations on the AHTS MP. Prowess demonstrates that safety must be managed through a systematic process, spanning from initial planning to continuous improvement. The dynamic offshore work environment necessitates the identification of potential hazards prior to the commencement of work to ensure risks are effectively controlled. This process requires the integration of hazard identification, risk assessment, the implementation of mitigation measures, supervision, and the evaluation of control effectiveness. Consequently, risk identification serves not merely as an administrative task but as a fundamental basis for safety-related decision-making throughout the course of the work.

**The Influence of Safety Culture on Worker Behavior and Compliance**

Safety culture plays a vital role in shaping worker behavior and compliance during pipeline operations aboard the AHTS MP. Prowess. This culture is reflected in the crew's commitment to prioritizing safety in every activity—from planning and execution to


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supervision and evaluation. Adherence to procedures is viewed not merely as an administrative obligation but as a shared responsibility to protect both oneself and colleagues. Consequently, a strong safety culture fosters work habits characterized by greater discipline, caution, and responsiveness to potential hazards.

The results of the study show that SOP, Permit to Work, Toolbox Meeting, JSA/HIRARC, the use of Personal Protective Equipment (PPE), equipment inspection, and Emergency Response Plan are important instruments in shaping crew safety behavior. The consistent application of these instruments helps workers understand potential hazards, risk levels, and control measures that must be taken before and during work. Compliance with procedures is also strengthened when crews understand that each safety provision has the purpose of preventing accidents, not just meeting company requirements. Therefore, understanding the meaning and purpose of procedures is an important part of building compliance that grows from worker awareness.

Master/Skipper leadership and officer example also determine the quality of safety culture in the ship's environment. Leaders who consistently implement procedures, provide clear directions, and take action against unsafe conditions can be an example for all crews to carry out their work responsibly. At the same time, open communication provides space for workers to report near misses, convey potential hazards, and use Stop Work Authority when work is deemed unsafe. These conditions create a work environment that encourages worker participation and reinforces the belief that safety is the responsibility of all ship personnel.

The competency and discipline factors of the crew also affect the consistency of safety behavior in pipeline work. The knowledge and skills gained through training help workers understand procedures, use equipment correctly, and make informed decisions when faced with risky situations. Conversely, a lack of competence, communication, or discipline can increase the likelihood of unsafe actions even though safety procedures are in place. Therefore, routine training, supervision, safety performance evaluation, and learning from every incident and near miss need to be carried out on an ongoing basis.

Overall, safety culture influences worker behavior and compliance levels by shaping how the crew perceives, assesses, and responds to risks in their daily operations. Developments in safety research for the 2021–2026 period emphasize risk-based safety management, safety culture, human factors, and the concept of a learning organization as complementary elements in accident prevention within the maritime and offshore industries. A safety culture supported by leadership, competence,


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communication, and continuous learning can transform compliance from a mere formal obligation into a work behavior ingrained in every crew member. Consequently, strengthening safety culture serves as a vital strategy for establishing a safe, disciplined, participatory, and sustainable pipeline work environment aboard the AHTS MP. PROWESS.

**Table 1. Summary of Discussion Based on Problem Formulation**

| Problem Formulation | Key Findings | Relevant Theories of the Last 5 Years | Recommendations |
|---|---|---|---|
| Safety procedures and their effectiveness | SOP, PTW, toolbox meeting, PPE, JSA, and ERP are the main instruments | Safety Management System, ISM Code, risk-based safety management | Compliance audits and post-employment evaluations |
| Key risks and mitigations | Dominant risks: leakage, fire, lifting, limited space, weather, fatigue | HIRARC/JSA, hierarchy of control, offshore risk assessment | Periodic risk matrix and permit strengthening |
| Culture of safety and compliance | Culture is influenced by leadership examples, communication, reporting near miss | Safety culture, safety climate, human factor, just culture | Stop work authority and two-way communication |

*Source: Data Processed by Researchers, 2026*

## CONCLUSION

Work safety procedures for pipeline operations on the AHTS MP. PROWESS have been implemented through SOPs, permits to work, toolbox meetings, JSA/HIRARC, the use of PPE, officer supervision, and emergency response readiness. The effectiveness of these procedures is evident in the division of responsibilities among


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departments; however, the consistency of implementation and the documentation of evaluations still require strengthening.

The main risks of pipeline work include fluid leaks, fire or explosion, lifting and material handling hazards, limited space, exposure to chemicals, weather changes, ship position deviations, and work fatigue. Mitigation is carried out through hazard identification, risk control, equipment inspection, operational communication, and safety training.

Safety culture affects worker behavior and compliance. Crews are more obedient when leaders set an example, safety communication is open, toolbox meetings are conducted meaningfully, and workers are given the authority to report hazards or stop unsafe work.

The Miles and Huberman method helps to systematically compile data through data reduction, presentation of data in tables/matrices, and the drawing of verified conclusions with observations, interviews, and documentation.

## RECOMMENDATION

Based on research findings regarding the implementation of workplace safety on the AHTS MP. PROWESS—which supports pipeline operations at the Chevron Oil Field in Thailand—safety improvements must be pursued in an integrated and sustainable manner by all parties involved. Workplace safety should not be viewed merely as a matter of fulfilling administrative obligations; rather, it must become an integral part of the vessel's operational strategy and work culture. Achieving this requires corporate commitment, leadership from the vessel's management, crew compliance, and consistent evaluation of safety systems. With the involvement of all stakeholders, the risks associated with pipeline operations can be managed more effectively, and a safe working environment can be maintained.

For shipping companies, strengthening the safety management system needs to be carried out through regular Occupational Safety and Health training and in accordance with the characteristics of offshore work. Training materials need to include the use of PPE, Permit to Work, Job Safety Analysis (JSA), hot work, limited space, leak handling, use of extinguishers, and emergency response procedures. Companies also need to build a culture of safety through leadership examples, open communication, appreciation for safe behavior, and an unsafe and near miss reporting system without causing fear for workers. In addition, regular SOP evaluation through audits, inspections, safety meetings, and crew input is needed so that procedures are always relevant to


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operational conditions, technological developments, and learning outcomes from incidents.

For ship management, especially Masters/Captains, Chief Officers, Chief Engineers, DP Operators, and Safety Officers, supervision of high-risk work needs to be strengthened from the preparation stage to the completion of the work. Oversight must ensure that Permit to Work, Toolbox Meeting, PPE use, equipment inspection, and risk control have been implemented consistently before work is carried out. Safety communication between departments also needs to be strengthened through safety briefings, clear radio communication, installation of safety signs, and the delivery of information about unsafe conditions quickly. In addition, the implementation of emergency drills on a regular basis is necessary so that all crews understand their roles, evacuation routes, use of safety equipment, and actions that must be taken when facing emergency conditions.

For ship crews, increased awareness, discipline, and compliance with procedures are an important part of preventing accidents in pipeline work. Each crew member needs to actively recognize potential hazards through Toolbox Meetings, understand JSA, take training, and make the experience of incidents and near misses a lesson. The use of PPE that is appropriate and in proper condition must be a work habit because it is a form of direct protection against various risks in the offshore environment. Crews also need to be encouraged to immediately report equipment damage, leaks, unsafe work areas, communication misunderstandings, and procedural irregularities so that corrective action can be taken before it develops into an accident.

For further research, work safety studies on offshore support vessels can be developed through quantitative approaches or mixed methods to obtain broader and measurable results. The research can test the relationship between K3 training, safety culture, compliance with the use of PPE, human factors, and accident rates, as well as strengthen the analysis through the HIRARC (Hazard Identification, Risk Assessment, and Risk Control) method. Human factor aspects such as fatigue, work pressure, communication, experience, competence, and decision-making are also important to be studied in more depth because they affect crew safety behavior. In addition, subsequent research can evaluate the effectiveness of the overall safety management system, including the implementation of the ISM Code, safety meetings, internal audits, near miss reporting, emergency drills, equipment inspections, and follow-up safety findings.


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