eISSN: 2721-5717; pISSN: 2747-2124 https://journal.unhas.ac.id/index.php/zonalaut

ZONA LAUT

JOURNAL OF OCEAN SCIENCE AND TECHNOLOGY INNOVATION

# Hose Handling Procedure In Ship To Ship Oil Transfer Activities At Banyu Urip Marine Terminal

Hajar Ayuning Tias*, Ari Sriantini, Nyoman Ardiana Listriawati
Ship Operations Engineering Technology Study Program, Faculty of Shipping Vocational, Hang Tuah University Surabaya
*ayuningt1610@gmail.com

**Abstract**

This study aims to investigate the implementation of hose handling procedures during the ship to ship transfer process in operational standards and safety requirements to maintain process continuity while minimizing the risk of work accidents, equipment damage, and marine pollution. In depth, this study identifies operational challenges faced throughout the process, and evaluates the steps taken to address those challenges. This study used a descriptive qualitative research design, utilizing direct observations, semi-structured interviews with crew members involved in ship to ship operations, and document analysis conducted aboard the AHTS ETZOMER 504 while operating at the Banyu Urip Marine Terminal (BUMT). The results showed that the hose handling process has implemented five interrelated operational phases: pre-transfer preparation and safety meeting, cargo hose retrieval from FSO Gagak Rimang, hose transfer to the receiving tanker, continuous supervision during cargo transfer, and safe hose termination after completion of operations. In addition, the main operational constraints include unfavorable weather and sea conditions that affect the stability of the ship, excessive pressure on the cargo hose, communication and coordination problems between participating ships, and gradual deterioration of equipment due to corrosion and repeated operational exposure. These challenges can be overcome through strengthening communication protocols, the implementation of strict occupational safety meetings, continuous weather assessments, and systematic inspections and preventive maintenance of operational equipment.

**Keywords:** ship-to-ship transfer, hose handling, operational safety, offshore oil transfer

## 1. INTRODUCTION

The increasing demand for crude oil has accelerated the development of offshore oil production and transportation systems to ensure a stable energy supply. In offshore oil fields, where direct access to port facilities is not available, Floating Storage and Offloading (FSO) facilities play a crucial role in temporarily storing crude oil before it is transferred to transport tankers for further distribution. The sustainability of this distribution process depends not only on the availability of transportation facilities but also on the implementation of safe and standardized operational procedures that minimize the risk of work accidents, equipment failures, and marine pollution. Therefore, every activity Transfer Offshore oil requires effective planning, competent personnel, reliable equipment, and compliance with international safety standards to ensure safe and efficient operation. [1].

One of the most common methods used in offshore crude oil transportation is Ship-to-Ship transfer (STS), which allows Charge moved directly between two ships without the need for a conventional loading terminal. Compared to loading and unloading operations in ports, Transfer STS presents greater operational challenges because it is carried out in an open ocean environment where the movement of ships is continuously affected by winds, waves, and ocean currents. [2]. One of the most common methods used in offshore crude oil transportation is transfer ship to ship (STS), which allows Charge moved directly between two ships without the need for a conventional loading terminal. Compared to loading and unloading operations in ports, Transfer STS presents greater operational challenges because it is carried out in an open ocean environment where the

Copyright is published underCreative Commons Attribution 4.0 International License.

movement of ships is constantly affected by winds, waves, and ocean currents. These environmental conditions increase operational risks and require accurate vessel maneuvering, effective communication, and strict adherence to established operational procedures. [3] emphasizing that successful STS operations depend on careful operational planning, environmental monitoring, and coordination among all personnel involved in the process Transfer.

Among the various stages of STS operation, the handling of hose is considered one of the most critical activities because it directly supports Transfer crude oil from the FSO to the receiving tanker. Handling hose Includes Pick-Up Hose Charge from FSO, placement hose at sea level, delivery to the receiving tanker, connection to manifold Charge, condition monitoring hose during Transfer Cargo, and returns hose after the surgery is completed. Because Hose Charge operating under dynamic offshore conditions, hose It is continuously subjected to mechanical loads caused by vessel movement, waves, and hydraulic pressure. Handling hose improper can increase the voltage hose, damaging components hose, causing leakage in the flange connection, delaying operation Transfer Cargo, and potentially result in environmental pollution. Therefore, the implementation of handling procedures hose The right balance is essential to maintain operational safety and ensure the sustainability of activities Transfer Offshore oil [4].

Several previous studies have highlighted the importance of procedural compliance in improving operational safety Transfer Cargo. [5] reported that compliance with Standard Operating Procedures (SOPs), effective supervision, and competence Crew Significantly reduce the occurrence of leaks Charge and operational accidents during handling Charge tankers. Similarly, [6] found that work discipline, safety awareness, and proper use of personal protective equipment are important factors in preventing work accidents during surgery Charge. Learn More [7] explained that the success of STS operations is influenced by the integration of equipment reliability, operational planning, personnel competence, and risk management across activities Transfer Cargo. [8] also identified human error and inadequate implementation of procedures as major contributors to operational failures during Transfer oil, highlighting the need for continuous supervision and effective communication among operational personnel.

Operational implementation of handling hose further supported by offshore support vessels, particularly Anchor Handling Tug Supply (AHTS) vessels, which play a critical role in transporting, positioning and monitoring Hose Charge during STS operation. [9]explains that maneuverability, equipment Deck, and the mooring tensile capability of the AHTS ship significantly contributes to maintaining stability Transfer and operational safety under a wide range of offshore environmental conditions. In addition, the OCIMF Guidelines for Handling [10], Storage, Use, Maintenance and Testing Hose STS and Guide Ship to ship transfer, IMO identify Hose Transfer as safety-critical equipment that must be handled, inspected, and maintained in accordance with approved operational procedures to prevent failure hose, oil spills, and environmental pollution [11].

At BUMT, Transfer crude oil between FSO Gagak Rimang and the shuttle tanker is carried out using a transfer Ship to ship (STS) bow to bow. In this configuration, the two vessels are positioned facing each other while the offshore support vessels assist in the operation. This method requires accurate vessel positioning and effective communication as the movement of the vessel directly affects stability Hose Charge. [12] states that proper coordination and stability of vessels are essential for safe and efficient offshore STS operations.

In this operation, the AHTS ETZOMER 504 acted as a handling vessel hose appointed, responsible for taking Hose Charge from the FSO, send it to the receiving tanker, assist the manifold splicing, monitor the condition of the hose during Transfer oil, and return hose After loading and unloading Charge. This activity requires experienced personnel, equipment Deck reliable, and effective coordination as offshore environmental conditions continue to affect vessel movement and stability hose. Nainggolan et al. (2025) emphasized that the operational capabilities of AHTS vessels play an important role in supporting operations Transfer Cargo Safe offshore [8].

Although the company's Standard Operating Procedures and international guidelines have been implemented, field observations above the AHTS ETZOMER 504 revealed several operational challenges during handling hose. This includes pick-up delays Hose Charge due to the unstable position of the vessel, communication difficulties during the connection of the manifold, voltage hose excessive weather conditions caused by ship movement, and adverse weather conditions affecting operations Transfer. [13] also identify environmental conditions and equipment reliability as important factors affecting the safety of offshore operations [14].

Copyright is published underCreative Commons Attribution 4.0 International License.

Previous studies have mostly addressed transfers between ships from the perspectives of cargo handling, operational efficiency, and navigation safety, while studies that specifically examined hose handling procedures performed by AHTS vessels are still limited.

Based on the review of these studies, the novelty (research gap) of this study lies in a special focus on the technical role of Anchor Handling Tug Supply (AHTS) vessels in the implementation of hose handling during ship to ship transfer bow to bow operations, an aspect that has not been studied in depth by previous studies that generally highlight general procedural compliance, human error, or cargo loading and unloading efficiency. The contribution of this research is to present detailed documentation of the operational stages of hose handling based on direct observations in the field, and to relate these findings to the provisions of the OCIMF Guidelines for the Handling, Storage, Use, Maintenance and Testing of STS Hoses and the IMO Ship to Ship Transfer Guide, so as to enrich a practical understanding of the safety practices of STS operations in Indonesian offshore waters.

## 2. METHODS

### 2.1 Types of Research

This study uses descriptive qualitative design with a case study design to analyze the implementation of hose handling procedures during ship-to-ship (STS) crude oil transfer operations supported by AHTS ETZOMER 504 at BUMT (BUMT), East Java, Indonesia. This study was chosen because it allows for an in-depth understanding of operational procedures, ship crew coordination, equipment utilization, and operational constraints in actual offshore working conditions.

The object of the study was the implementation of the hose handling procedure carried out by the crew of the AHTS ETZOMER 504 ship, covering all operational stages starting from pre-transfer preparation, hose cargo pickup, delivery and connection of the hose to the tanker manifold, monitoring during cargo transfer, and hose recovery after operation. Data were obtained through direct observation, semi-structured interviews, and document analysis. The interviews involved five key personnel directly responsible for hose handling activities, namely Mooring masters, Skippers, Deck Officers, Bosuns, and Skilled Sailors (Able Seamen/AB).

This study did not manipulate operational variables because all observations were made during actual STS operations. Fixed variables included the research site, support vessels, bow to bow transfer methods, and Standard Operating Procedures (SOPs) as well as applicable international regulations. The observed variables consisted of the implementation of hose handling procedures, equipment readiness, crew coordination, communication effectiveness, environmental conditions, and operational constraints encountered during the transfer process.

The descriptive qualitative case study method has been widely applied in maritime operational research because it provides detailed information regarding work procedures and operational practices under real-world conditions. Although the findings are limited to the observed cases, it is considered appropriate for evaluating the implementation of hose handling procedures and identifying factors that affect the safety and effectiveness of offshore oil transfer operations.

### 2.2 Data Source

The object of the study was the implementation of hose handling procedures during ship to ship (STS) crude oil transfer operations assisted by AHTS ETZOMER 504 at BUMT (BUMT), East Java, Indonesia. This study focuses on the evaluation of each stage of hose handling, including pre-transfer preparation, collection of cargo hose from FSO Gagak Rimang, delivery and connection of hose to the receiving tanker, monitoring during cargo transfer, and recovery of hose after operation. In addition, this study also examines operational constraints that affect the safety and effectiveness of hose handling activities.

The study used both primary and secondary data. Primary data were collected through direct observation of hose handling operations and semi-structured interviews with five personnel directly involved in the operation, namely Mooring Master, Skipper, Officer Deck, Bosun, and Able Seaman (AB). These participants were selected because they had different operational responsibilities and provided comprehensive information regarding the implementation of hose handling procedures.

Copyright is published underCreative Commons Attribution 4.0 International License.

The selection of the five informants was carried out using purposive sampling techniques, taking into consideration that each has different direct involvement and operational responsibilities at each stage of hose handling so that collectively they can provide a comprehensive picture of the implementation of procedures in the field. The characteristics of the informant include the Mooring Master who plays a role in granting operational clearances and coordination between ships, the Captain who is responsible for ship maneuvers and operational safety decisions, the Deck Officer who oversees the readiness of deck equipment and the use of Personal Protective Equipment, the Bosun who leads the technical implementation of hose picking and connection, and the Able Seaman which is directly involved in the physical work of handling the hose on the deck. [Note to authors: please complete each informant's tenure/experience as per the field data to strengthen validity]. This combination of complementary roles and responsibilities allows for triangulation of information sources and reinforces the validity of research findings.

Secondary data are obtained from the company's operational documents, including Standard Operating Procedures (SPEC-VES11-01), safety checklists, operational records, and relevant international regulations such as MARPOL Annex I Chapter 8, OCIMF Ship-to-Ship Transfer Guidelines, International Safety Management (ISM) Codes, and IMO Resolution A.683(20). These documents are used to verify field observations and evaluate whether operational practices are in compliance with applicable safety standards and international maritime regulations.

### 2.3 Time and Place

This research was conducted aboard the AHTS ETZOMER 504 during a ship-to-ship crude oil transfer (Ship-to-Ship/STS) operation between FSO Gagak Rimang and a shuttle tanker at BUMT (BUMT), Tuban, East Java, during a four-month period from March 2025 to June 2025.

During the study period, the authors directly observed a complete set of hose handling activities, including pre-transfer preparation, cargo hose retrieval from the FSO, delivery and connection of the hose to the tanker manifold, monitoring during crude oil transfer, and hose retrieval after the transfer operation is complete. In addition, interviews with operational personnel and a review of the company's operational documents were conducted to support and verify the results of field observations.

### 2.4 Data Collection Techniques

The data in this study was collected using three techniques: observation, semi-structured interviews, and documentation. These techniques were used to obtain comprehensive information on the implementation of hose handling procedures during the Ship-to-Ship (STS) crude oil transfer operation on board the AHTS ETZOMER 504. The three data collection techniques are described as follows.

Observations were carried out directly during hose handling operations aboard the AHTS ETZOMER 504. Observations were focused on the implementation of each operational stage, including pre-transfer preparation, hose cargo retrieval, connection of hose to tanker manifold, monitoring during oil transfer, and recovery of hose after operation. In addition, observations were carried out to identify the coordination of the ship's crew, the use of equipment, and the operational obstacles faced during the process.

Semi-structured interviews were conducted with five operational personnel who were directly involved in hose handling activities, namely Mooring master, Skipper, Deck Officer, Bosun, and Able Seaman. The interview aimed to obtain information regarding operational procedures, individual responsibilities, coordination between crew members, and challenges faced during hose handling operations.

Documentation is collected from the company's operational records and supporting documents, including Standard Operating Procedures (SPEC-VES11-01), safety checklists, operational reports, photographs, and relevant international regulations. These documents are used to support and verify data obtained from observations and interviews.

### 2.5 Data Analysis Techniques

Data collected through observation, semi-structured interviews, and documentation were analyzed using qualitative descriptive design. The analysis was conducted systematically to identify the implementation of hose handling procedures during the Ship-to-Ship (STS) crude oil transfer operation on board the AHTS ETZOMER 504. The data analysis process consists of the following stages:

Copyright is published underCreative Commons Attribution 4.0 International License.

### 2.5.1 Data Reduction

At this stage, the collected data is selected, classified, and simplified according to the purpose of the study. The information is grouped based on the stages of hose handling procedures, operational constraints, ship crew coordination , equipment readiness, and compliance with the company's Standard Operating Procedures (SOPs).

### 2.5.2 Data Presentation

The organized data is then presented in the form of descriptive explanations, tables, and drawings for easy interpretation. This stage allows the researcher to explain the implementation of the hose handling procedure and identify the factors that affect the safety and effectiveness of the operation.

### 2.5.3 Conclusion Drawing

The final stage involves drawing conclusions based on observations, interviews, and documentation. The findings are analyzed to evaluate the implementation of hose handling procedures, identify operational constraints, and formulate recommendations to improve the safety and efficiency of oil transfer operations between ships.

## 3 RESULTS AND DISCUSSION

### 3.1. Hose Handling Implementation Procedure

AHTS ETZOMER 504 is an offshore support vessel owned by PT Pelayaran Nasional Ekalya Purnamasari and was specifically assigned as a hose handling vessel during Ship to Ship (STS) crude oil transfer operations at BUMT (BUMT), an offshore oil terminal jointly operated by ExxonMobil Cepu Limited (EMCL). The vessel is equipped with dedicated deck equipment , including towing cranes, stern rollers, capstans, towing cranes, and deck cranes to support hose cargo handling operations in dynamic offshore conditions. These facilities play a critical role in ensuring the safe transfer, connection, monitoring, and retrieval of cargo hose while minimizing operational risks during offshore oil transfer activities.



Figure 1. AHTS ETZOMER 504 Ship Source: Researcher data (2025)

Based on field observations, interviews, and documentation, the implementation of hose handling on board the AHTS ETZOMER 504 consists of five sequential stages: pre-transfer preparation, hose cargo retrieval, cargo hose delivery and manifold connection, monitoring during cargo transfer, and hose recovery. These

Copyright is published underCreative Commons Attribution 4.0 International License.

stages are interrelated and must be carried out systematically as each stage contributes to the overall safety and effectiveness of crude oil transfer operations between ships.

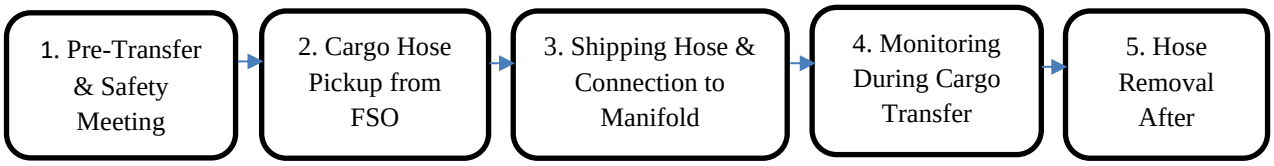


Figure 2. Flow chart of the stages of the hose handling procedure Source: Processed by the author (2025)

The first stage is pre-transfer preparation. Before entering the 500-meter safe zone around the Gagak Rimang FSO, all operational personnel participate in a brief meeting to discuss work, operational responsibilities, and potential hazards. A Task Risk Assessment (TRA) is conducted to identify possible risks and determine appropriate control measures before operations begin. The ship's crew also inspects navigation equipment, communication devices, hose handling equipment, lifting equipment, and Personal Protective Equipment (PPE). Environmental conditions, including wind speed, wave height, ocean currents, and weather forecasts, are evaluated to determine whether operations can be carried out safely. The results of observations show that careful preparation improves the ship's crew readiness and reduces operational risks because each member of the ship's crew clearly understands their respective duties before commencing operations.

The second stage involves the retrieval of the cargo hose from the FSO Gagak Rimang. After receiving operational clearance from the Mooring master, the AHTS ETZOMER 504 carefully steers its stern towards the guide rope installed by the FSO. The guide rope is caught using a hook hook and pulled onto the ship with the help of a capstan and a towing winch. Once the cargo hose is secured on deck, the ship crew inspects the hose body, flange connections, gaskets, shackles, chains, and lifting accessories to ensure that all components are in good condition before being handed over to the receiving tanker. Field observations show that the accuracy of the ship's maneuvers and effective communication between the platform team and the deck crew is critical during this stage as changes in wave and current conditions can affect the position of the vessel and increase the difficulty of retrieving the cargo hose safely.



Figure 3. Taking a cargo hose from FSO Gagak Rimang Source: Researcher data (2025)

The third stage is the delivery of the cargo hose and the connection of the manifold. After the inspection, the vessel moves towards the receiving tanker while maintaining a safe operational distance. The tanker crane is then connected to the lifting chain attached to the cargo hose so that the hose can be lifted and positioned to the tanker manifold. Throughout this process, continuous communication is maintained between the Captain of AHTS ETZOMER 504, the Main Officer of the receiving tanker, and the Mooring Head to ensure that the hose connection is completed accurately and safely. The results of the observations show that effective coordination among all operational personnel minimizes installation errors, reduces operational delays, and prevents possible oil leakage during cargo transfers.

Copyright is published underCreative Commons Attribution 4.0 International License.



Figure 4. The Process of Moving Hoses to Tankers. Source: Researcher data (2025)

The fourth stage consists of continuous monitoring during cargo transfer. During pumping operations, the ship's crew continuously monitors the hose voltage, manifold connections, mooring rope conditions, ship position, and environmental changes. Wind speed, wave height, and ocean currents are observed regularly as these factors directly affect the vessel's movement and hose stability. Any abnormal hose movement , overvoltage, leakage, or unexpected environmental change requires immediate corrective action to prevent equipment damage and environmental pollution. Continuous monitoring also allows operational personnel to maintain effective communication and respond quickly to any abnormal situations that may arise during the cargo transfer process.

The final stage is the recovery of the hose after the cargo transfer is completed. Upon confirmation that the cargo pumping has stopped, the cargo hose is removed from the tanker manifold and carefully returned to the Rimang Crow FSO using a tanker crane and deck equipment aboard the AHTS ETZOMER 504. Once the hose is secured securely, the ship's crew performs a final inspection of the hose, lifting equipment, shackles, chains, and other supporting equipment to identify any damage that may occur during the operation. Proper retrieval of the hose not only completes the transfer process safely, but also ensures that all equipment remains in good condition and ready for the next intership transfer operation.



Figure 5. Removal of hose cargo after the transfer activity is completed. Source: Researcher data (2025)

Copyright is published underCreative Commons Attribution 4.0 International License.

Overall, the research findings show that the implementation of hose handling procedures on board the AHTS ETZOMER 504 has generally been carried out in accordance with the company's Standard Operating Procedures (SPEC-VES11-01) and applicable operational requirements. The successful implementation of each operational stage is influenced by several key factors, including equipment readiness, effective communication, crew competence , accurate vessel maneuvering, and continuous monitoring of environmental conditions. These findings show that the success of hose handling operations depends not only on technical capabilities but also on strong coordination among all operational personnel to maintain the safety, efficiency, and reliability of crude oil transfer operations between ships in BUMT.

### 3.2. Obstacles During Hose Handling Activities

Field observations identified four main obstacles that affected the implementation of hose handling operations on board the AHTS ETZOMER 504 during STS transfer activities at BUMT. These constraints included ship position instability, excessive hose cargo tension , communication and coordination difficulties, and equipment malfunctions. Each of these factors has a direct impact on operational safety, efficiency, and continuity of the transfer process.

The first operational obstacle is the instability of the ship's position caused by changes in sea currents, wave heights, and wind conditions. During hose cargo retrieval, the AHTS ETZOMER 504 is required to maintain a proper maneuvering position when decking the conveyor rope deployed from the Gagak Jungle FSO. However, fluctuations in environmental conditions often cause the ship to drift from the desired position, making the retrieval process more difficult and increasing the time required to complete the operation. Therefore, maintaining the position of the vessel is one of the most important factors that affect the success of hose handling activities.

The second obstacle is the excessive tension acting on the cargo hose during transfer operations. Strong winds and vessel movements create additional stress on the hose, especially when the receiving tanker is subjected to constant movement due to waves. Excessive hose tension not only increases the likelihood of damage to the cargo hose and manifold connections, but also poses a potential risk of oil leakage if corrective action is not taken immediately. As a result, the Skipper and deck crew continuously monitor the movement of the hose and adjust the position of the ship whenever abnormal hose tension is observed.

Another challenge identified during the study was communication and coordination among the operational parties involved. Effective communication between the FSO, AHTS ETZOMER 504, and the receiving tanker is essential at every stage of hose handling. However, occasional VHF radio interference and differences in procedure interpretation sometimes delay operational responses, especially during hose connection and retrieval. Although these issues did not result in operational accidents during the observation period, it does demonstrate the importance of maintaining clear communication protocols and standardized operational commands among all participating vessels.

The last operational obstacle involves damage to the hose handling equipment. Constant exposure to seawater accelerates corrosion of the chains, shackles, and other lifting accessories, while repeated operational use gradually reduces the condition of the mooring rope and supporting equipment. Although all equipment remains operational during the observation period, regular inspections and preventive maintenance are essential to ensure the reliability of the equipment and prevent mechanical failures during future operations.

Overall, the findings show that operational constraints during hose handling are affected not only by environmental conditions but also by equipment conditions and operational coordination. These factors require constant monitoring as they directly affect the operational safety and efficiency of crude oil transfer activities between ships.

When associated with the provisions of the OCIMF Guidelines for the Handling, Storage, Use, Maintenance and Testing of STS Hoses and the IMO Ship to Ship Transfer Guide, the four operational constraints are in line with the risks that have been identified in the two international guidelines, especially related to the importance of assessing environmental conditions before and during operation, mechanical stress limitation on hose cargo, standardized communication procedures between participating ships, and periodic preventive inspection and maintenance programs of hose equipment . Thus, these field findings not only describe the actual conditions in BUMT, but also confirm the relevance of the application of these international standards as a reference framework in controlling operational risks of hose handling.

Copyright is published underCreative Commons Attribution 4.0 International License.

### 3.3 Interview Results

The interview findings further support the results obtained through field observations. Five operational personnel directly involved in hose handling activities were interviewed, consisting of Mooring masters, Skippers, Deck Officers, Bosuns, and Skilled Sailors (ABs). Although each respondent had different operational responsibilities, they all agreed that effective communication, ship crew competence , equipment readiness, and favorable environmental conditions were the main factors determining the success of hose handling operations.

According to the Mooring master, weather conditions are the most influential variable that affects operational safety. He explained that hose handling operations should be stopped whenever wind speeds exceed 20 knots or wave heights exceed 1.5 meters because these conditions significantly reduce the maneuverability of ships and increase operational risks. This statement indicates that environmental constraints are strictly considered before operational decisions are made.

The Skipper emphasized that the stern maneuver of the AHTS ETZOMER 504 towards the guide rope required extensive experience, concentration, and proper control of the vessel. He also stated that the authority to stop operations remained in the hands of the Skipper whenever sea conditions were deemed unsafe, even if operational preparations had been completed. These findings suggest that navigation assessments play an important role in ensuring safe hose handling operations .

The Deck Officer explained that his primary responsibility is to ensure the readiness of all deck equipment and the proper use of Personal Protective Equipment (PPE) by each crew member. He also highlighted the importance of checking the flanges, gaskets, and hose connections before the cargo transfer begins to minimize the possibility of leaks during operations.

Bosun stated that one of the most challenging activities was connecting the hooks of the tanker crane to the hose cargo grab chain while the two vessels continued to move under the influence of waves and currents. This process required close coordination between the crew deck and the crane operator as inappropriate timing could delay the hose joining process.

Meanwhile, the Skilled Seafarer emphasized the importance of conducting regular inspections of chains, shackles, and mooring ropes as continuous exposure to seawater accelerates corrosion and wear and tear of equipment. He also emphasized the need to maintain personal awareness when working on slippery deck surfaces to reduce the risk of work accidents.

The findings of the interviews further support the results obtained through field observations. Five operational personnel directly involved in hose handling activities were interviewed, consisting of Mooring masters, Skippers, Deck Officers, Bosun, and Able seamen. Although each respondent had different operational responsibilities, they all agreed that effective communication, ship crew competence , equipment readiness, and favorable environmental conditions were the main factors that determined the success of hose handling operations.

According to the Mooring master, weather conditions are the most influential variable that affects operational safety. He explained that hose handling operations should be stopped whenever wind speeds exceed 20 knots or wave heights exceed 1.5 meters because these conditions significantly reduce the maneuverability of ships and increase operational risks. This statement indicates that environmental constraints are strictly considered before operational decisions are made.

The Skipper emphasized that the stern maneuver of the AHTS ETZOMER 504 towards the guide rope required extensive experience, concentration, and proper control of the vessel. He also stated that the authority to stop operations remained in the hands of the Skipper whenever sea conditions were deemed unsafe, even if operational preparations had been completed. These findings suggest that navigation assessments play an important role in ensuring safe hose handling operations .

The Deck Officer explained that his primary responsibility is to ensure the readiness of all deck equipment and the proper use of Personal Protective Equipment (PPE) by each crew member. He also highlighted the importance of checking the flanges, gaskets, and hose connections before the cargo transfer begins to minimize the possibility of leaks during operations.

Bosun stated that one of the most challenging activities was connecting the tanker crane to the hose cargo retriever chain while the two vessels continued to move under the influence of waves and currents. This process required close coordination between the crew deck and the crane operator as inappropriate timing could delay the hose connection process. Meanwhile, the Skilled Seafarer emphasized the importance of conducting regular inspections of chains, shackles, and mooring ropes as continuous exposure to seawater

Copyright is published underCreative Commons Attribution 4.0 International License.

accelerates corrosion and wear and tear of equipment. He also emphasized the need to maintain personal awareness when working on slippery deck surfaces to reduce the risk of work accidents.

The results of the interviews consistently show that successful hose handling operations depend on the integration of technical competence, effective communication, operational discipline, and constant adherence to established safety procedures

Table 1. Summary of Informant Interview Results

| Informants | Key Roles/Responsibilities | Key Findings of the Interview |
|---|---|---|
| Mooring Master | Granting operational permits and coordination between ships | Hose handling operation is stopped when the wind speed exceeds 20 knots or the wave height exceeds 1.5 meters |
| Skipper | AHTS vessel maneuvers and safety decision authority | The stern maneuver towards the guide rope requires high experience; The skipper is authorized to stop the operation if the sea conditions are considered unsafe |
| Officer Deck | Deck equipment readiness and use of crew PPE | Inspection of flanges, gaskets, and hose connections prior to cargo transfer is important to minimize the risk of leakage |
| Bosun | Technical implementation of hose picking and connection | Connecting the tanker crane to the hose grab chain as the two vessels move is the most challenging stage |
| Able Seaman | Physical work of handling hoses on deck | Regular inspections of chains, shackles, and mooring ropes are important due to corrosion; personal vigilance is required on slippery deck surfaces |

### 3.4 Compliance with International Regulations

The findings of the study show that the implementation of hose handling procedures on board the AHTS ETZOMER 504 is generally in accordance with applicable international regulations and industry best practices governing crude oil transfer operations between ships. Compliance is demonstrated through the implementation of the Intership Operating Plan, the company's Standard Operating Procedures, and the Safety Management System established under the International Safety Management Code (ISM).

During the observed operation, each stage of hose handling is carried out in accordance with the requirements of MARPOL Annex I Chapter 8 regarding the prevention of marine pollution during oil transfer between ships. Operational activities also follow the technical recommendations contained in the OCIMF Intership Transfer Guide, in particular regarding equipment inspections, communication procedures, environmental assessments, and operational monitoring during cargo transfers.

In addition, the operational characteristics of the AHTS ETZOMER 504 as an offshore support vessel were found to be consistent with the safety principles set out in IMO Resolution A.683(20), which emphasizes vessel capability, operational readiness, ship crew competence , and risk management during offshore support activities. Overall, the findings suggest that compliance with international regulations alone is not enough to guarantee operational success. Safe and efficient hose handling also depends on effective crew coordination, proper equipment maintenance, ongoing environmental monitoring, and consistent implementation of established operational procedures. The integration of these elements forms the basis for achieving reliable, safe and environmentally responsible crude oil transfer operations between ships at BUMT [15].

### 3.5 Practical Implications

The findings of this study provide a number of practical implications that can be applied by various stakeholders to improve the effectiveness of communication, equipment inspection, and safety of STS operations. For terminal operators (BUMTs), it is recommended to strengthen standardized communication protocols between all vessels involved, including the establishment of backup radio channels and operational instruction reconfirmation procedures to reduce the risk of communication interruptions during connection and hose retrieval. For shipping companies, especially AHTS ship owners and managers, it is recommended to develop a more stringent schedule of preventive inspection and maintenance of chains, shackles, mooring ropes, and hose lifting accessories in view of the high rate of corrosion due to exposure to seawater, as well

Copyright is published underCreative Commons Attribution 4.0 International License.

as to conduct regular training and simulations for crews to improve competence and readiness to face dynamic environmental conditions. For AHTS ship operators in particular, it is recommended to implement a more detailed operational readiness checklist at the pre-transfer preparation stage, including consistent verification of wind speed and wave height threshold as objective criteria for deciding on the continuation or termination of operations. The integrated implementation of these recommendations is expected to support the creation of safer, more efficient, and hose handling operations that are in line with the provisions of the OCIMF and the IMO Ship to Ship Transfer Guide.

## 4. CONCLUSION

Based on the results of observations, interviews, and documentation, it can be concluded that the implementation of hose handling procedures on board the AHTS ETZOMER 504 during crude oil transfer operations between ships at BUMT consists of five successive stages: pre-transfer preparation, hose cargo pickup, hose cargo delivery and manifold connection, monitoring during cargo transfer, and hose recovery after the completion of cargo transfer. These operational stages are generally carried out in accordance with the company's Standard Operating Procedures and relevant international regulations, including MARPOL Annex I Chapter 8, the OCIMF Intership Transfer Guide, the ISM Code, and IMO Resolution A.683(20).

The study also identified that the effectiveness of hose handling operations is influenced by three main factors, namely technical factors related to equipment reliability, human factors related to the competence and communication of ship crews, and environmental factors including wind, waves, and ocean currents. To improve operational safety and efficiency, continuous efforts should be focused on strengthening pre-transfer safety planning, implementing scheduled equipment maintenance, improving environmental monitoring, improving ship crew competencies through routine training and simulations, and strengthening communication systems among all participating ships. These measures are expected to support the implementation of safer, more efficient, and sustainable crude oil transfer operations between ships.

## ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to Hang Tuah University Surabaya and PT Pelayaran Nasional Ekalya Purnamasari (ELPI) for the opportunities, facilities, and support provided during this research. Appreciation is also expressed to the officers and crew of the AHTS ETZOMER 504 ship for their cooperation, assistance, and valuable information during the field observation and data collection process.

## REFERENCES

[1] V. Richard, "Factors Influencing Safety Risks in Processes Transfer Workers from PTAS Amanah Ship to Boat Landing Platform of Oil and Gas Refinery at Champion Oil Field. Ivet University.," 2025.
[2] M. Sökükcü, "New Trends and Issues Proceedings on Advances in Pure and Applied Sci- ences Ship-to-ship tanker Transfer operations and risk analysis : Probabilis- tic approach," vol. 15, no. 1, pp. 1–15, 2022.
[3] B. A. Pangestu and et al., "Analysis of Delay in the Loading Process of High Sulfur Fuel Oil (HSFO) and Low Sulfur Fuel Oil (LSFO) by Ship to Ship at Mt. Cendrawasih Analysis," pp. 1–7, 2024.
[4] Q. A. Sabaruddin1* , Indra Muda2 , Harris R. Dahlan3 , Eka Nurmala4 and 5 1, 3, 4, "Analysis of the Role of SV Ships . Fiona 38 in Supporting Lifting Operations," vol. 5, no. 1, pp. 266–272, 2026.
[5] S. Sartini and et al., "Analysis of Oil Product Loading and Unloading Process on Tankers," Maj. Ilm. Maritime Jogja, vol. 20, no. 1, pp. 62–73, 2022, doi: 10.33489/mibj.v20i1.290.
[6] A. Palapa and et al., "Efforts to Prevent Work Accidents in MV. Mochtar Prabu Mangkunekagara in the Process of Loading and Unloading Fertilizer," KALAOS Kalao's Marit. J., vol. 3, no. 2, pp. 46–60, 2022.
[7] A. Irwan and et al., "ANALYSIS OF PLANNING OF SHIP TO SHIP LOADING ACTIVITIES TRANSFER) REVIEWED FROM THE ASPECT OF SHIPPING SAFETY Asep," no. 2021, 2024.
[8] Sandi Febriansyah and et al., "Human Error Analysis of Activities Transfer Oil in the Tank Farm Speciality Fats Department Using the HEART Method at PT. X," J. Ind. Manuf. Eng., vol. 9, no. 1, pp. 15–23, 2025, doi: 10.31289/jime.v9i1.12999.

Copyright is published under Creative Commons Attribution 4.0 International License.

[9] A. Y. Nainggolan and et, "Analysis of Productivity of Loading Activities with the Ship to Ship Process on Ships Brokered by PT. Adhika Samudera Jaya Banjarmasin Branch," vol. 4, no. 2, pp. 4972–4977, 2025.
[10] OCIMF, "Guidelines for the Handling, Storage, Use, Maintenance and Testing of STS Hoses."
[11] IMO, "ANY OTHER BUSINESS Second (2025) edition of the Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (STS Transfer Guide)," 2025.
[12] Sabaruddin and al., "Optimizing Ship-to-Ship Activities (STS) for Operational Effectiveness on MT. Mount Kemala Optimizing Ship-to-Ship (STS) Activities for Effectivity Operations on MT . Mount Kemala," vol. 2, no. 1, pp. 32–41, 2025.
[13] Resulation A.683(20), "CODE OF SAFE PRACTICE FOR THE CARRIAGE OF CARGOES AND PERSONS BY OFFSHORE SUPPLY VESSELS (OSV CODE)."
[14] I. N. Kholiq and et al., "Risk Mitigation Strategies in Operations Transfer Ship to Ship Coal: MV Operational Safety Analysis. Lumoso Jaya in Bojonegara," no. March, 2025.
15] International Chamber of Shipping (ICS), Oil Companies International Marine Forum (OCIMF), and International Association of Ports and Harbors (IAPH), "International Safety Guide for Oil Tankers and Terminals (ISGOTT)," 6th ed., 2020.

Copyright is published underCreative Commons Attribution 4.0 International License.