The Indonesian Journal of Occupational Safety and Health
2024, 13 (1): 53-64
p ISSN: 2301 8046, e ISSN: 2540 7872
http://doi.org10.20473/ijosh.v13i1.2024.53-64

ORIGINAL ARTICLE

Safety Perceptions among Ship-to-Shore (STS) Crane Operators at PT Terminal Teluk Lamong

Sentagi Sesotya Utami[1], Winny Setyonugroho[2], Moch Zihad Islami[3], Iman Permana[4], Janatarum Srihandono[5], Tipung Muljoko[6]

[1]Department of Nuclear Engineering and Engineering Physics, Universitas Gadjah Mada, Yogyakarta, Indonesia
[2]Master of Hospital Management, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia
[3]Faculty of Philosophy, Universitas Gadjah Mada, Yogyakarta, Indonesia
[4]Master of Nursing, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia
[5]Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia
[6]PT Terminal Teluk Lamong, Surabaya, Indonesia

ABSTRACT

Introduction: Ship-to-shore (STS) crane operators strive for efficiency in their work, but they must take a hard look at their high-risk jobs. It is necessary to learn how to improve occupational safety and health. This study aims to investigate the problems faced by STS crane operators working in container ports and to understand the importance of fit-for-work monitoring procedures, particularly for individuals working in high-risk industries such as STS operators. **Methods:** This study used a qualitative approach, and data were collected through interviews and observations of STS operators and in-house clinic staff. Nine STS operators, two in-house clinic staff, and two safety, health, and environment (SHE) staff were interviewed. **Results:** This study found that container terminal companies emphasise two critical aspects for STS operators: productivity and occupational safety and health. STS operators face health problems, including physical and psychological problems, due to the fast-paced work system, sleep patterns, daily activities, and thoughts that are difficult to control. Employees have coping mechanisms to deal with fatigue, and stakeholders have effectively communicated the company's safety and health culture. Most stakeholders in a container terminal company want a fit-for-work monitoring system to make the business efficient and sustainable. **Conclusion:** The STS industry faces a significant problem with operator fatigue, which can negatively impact safety and productivity. This issue requires a comprehensive strategy, including legislation to regulate working hours and shift patterns, technology to combat fatigue, and operator education and training.

Keywords: high risk, STS operator, fit-for-work, monitoring, technology

Corresponding Author:
Winny Setyonugroho
Email: wsetyonugroho@umy.ac.id
Telephone: +62 87739510007

INTRODUCTION

As an archipelagic state, Indonesia relies heavily on maritime transportation due to its scattered islands and challenging terrain, which makes developing inland transportation infrastructure difficult and costly (Puriningsih and Ka, 2018). This makes the shipping industry crucial for the country's international trade and sustainable economic and social development (Wu, Wang and Wang, 2022). Efficient port operations are essential as most international trades are carried out through maritime transportation. Seaport terminals, especially container terminals, are vital in connecting sea and land transportation and are critical to global business and logistics. They contribute significantly to the global economy, trade growth, and economic integration among nations. Efficient and well-functioning container terminals are key drivers of global economic growth, handling over 80 percent of global merchandise trade (International Labour Organization, 2018).

Container terminals are classified as a high-risk industry due to various factors, such as activities

Cite this as: Utami, S.S., *et al*. (2024) 'Safety Perceptions among Ship-to-Shore (STS) Crane Operators at PT Terminal Teluk Lamong', *The Indonesian Journal of Occupational Safety and Health*, 13(1), pp. 53-64.

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involving heavy machinery and equipment, and large volumes of cargo. It is also associated with exposure to hazardous materials, complex logistics and operations, and operational constraints (Khan, Yin and Mustafa, 2021). Although the continuous development of cargo-handling equipment with increased capacity and reach has brought significant safety improvements for port workers, it has also introduced new risks. Port work remains a profession with high accident rates, highlighting the ongoing need for safety measures (International Labour Organization, 2018).

One such notable development in cargo handling is the use of ship-to-shore (STS) cranes. It is an essential piece of equipment for container terminal operations. This large crane removes cargo from ships and loads it onto trucks or trains to be transported to its final location. STS is supported by quay cranes, which facilitate the transfer of containers between ships and the operational area (Cobo, 2016). These cranes can handle 20- to 40-foot containers weighing up to 100 tons, among other sizes and weights (Edforss and Hansson, 2019). Because of the high risk associated with container terminals, strict safety measures are required to protect the health and safety of personnel, property, and cargo. The operation of an STS crane requires a competent operator who uses a remote control to regulate the movements of the crane. The operator's job requires great hand-eye coordination and spatial awareness to ensure the safe and precise lifting and positioning of containers (Cobo, 2016).

For high-risk occupations such as STS operators, occupational safety and health (OSH) is critical. Monitoring the fitness of personnel is essential to ensure safety. Therefore, fit-for-work monitoring systems must be implemented in these industries. According to Nasirzadeh *et al*. (2020), fit-for-work monitoring systems are crucial to ensure that workers have the physical and mental capacity to perform their job duties safely and effectively. This helps prevent occupational accidents and injuries. Regular health screenings, including drug and alcohol testing, physical examinations, mental health assessments, and continuous monitoring of the health and well-being of workers are usually part of these systems.

Workers in container ports often face hazardous working conditions, such as working in high temperatures and with heavy machinery and toxic chemicals (Schulte *et al*., 2022). In addition, the nature of their work exposes them to health risks, including ergonomic, chemical, biological, and physical hazards (Edforss and Hansson, 2019). These working conditions can effect the ability of workers to performs their jobs safely by causing physical and mental exhaustion. The concept of worker well-being emphasises the importance of quality of life. It takes into account issues inside and outside the workplace to enable workers to thrive and reach their full potential (Edforss and Hansson, 2019).

The fit-for-work system contributes to the prevention of accidents by ensuring that employees have the physical and mental capacity to do their tasks (Qiu, Zhu, and Lu, 2021). Another benefit of such a system is the identification of employees who may be more susceptible to occupational health problems. By providing regular health screenings, including psychological and physical assessments, as well as the necessary protective equipment and training, employers play a crucial role in implementing the fit-for-work system (International Labour Organization, 2018). In order for employees to perform their duties safely and successfully, companies must also ensure that they are properly trained. Furthermore, cultivating a positive safety culture within the company is crucial because it supports the health and well-being of employees and motivates them to disclose any occupational health problems or concerns (Fang *et al*., 2018).

With a specific focus on STS operators, this study investigates attitudes towards the need for and significance of fit-for-work monitoring systems in high-risk workplaces. While no specific research has been done on the phenomenological views of high-risk employment among STS operators, it is imperative to increase knowledge about safety measures and factors that encourage or discourage workers from raising safety issues. It is critical to create a work environment that upholds safety (Mathisen, Tjora, and Bergh, 2022). Gaining insight into the issue of fatigue faced by STS operators is crucial to improving business performance while maintaining OSH. This study investigates how STS crane operators perceive the need for a monitoring system to improve productivity and performance in terminal container operations.

METHODS

Research Design

This study aims to investigate the experiences and OSH issues of STS crane operators in container terminals. Based on this objective, this study aims to explore the importance of and need for a fit-to-work monitoring approach for STS operators. In order to better understand the requirements of these operators and guide their decision-making, phenomenological research methods were employed to examine their experiences and perceptions (Van Manen, 2014). Phenomenological techniques provide useful insights into the views of STS operators and terminal management, helping to identify the necessary support and information to improve health and safety standards. According to Creswell and Poth (2016), this method allows for the collection of more accurate data based on the perspectives of the subjects and offers a more authentic understanding of their experiences.

Data Collection

This study received ethical approval with a certificate number 2895/KEP-UNISA/V/2023. This study was conducted at the Terminal Teluk Lamong (TTL) company, a Pelindo subsidiary located in the city of Surabaya, East Java, Indonesia. In-depth interviews and observations were the two data collection methods used in this study. Informants were asked about their opinions on health and safety regulations, length of employment, and everyday practices related to health care. Audio recordings of these interviews, which took place in January 2023, were used to learn more about the opinions of the employees on the fit-for-work monitoring technology. The in-depth interviews were tailored to the individual experiences of each informant, following interview standards derived from existing research. Over four days, observations were made in several PT locations, including the in-house clinic, the STS crane room, and the terminal container operation. This allowed for direct and personal observation of health and safety procedures in these locations.

Informants for this study were selected using purposive sampling techniques. The informants were selected based on their roles and areas of expertise regarding health and safety regulations within the terminal. In particular, nine people, who were STS crane operators, were the main subjects of this study. Additionally, two employees of the in-house clinic of the company were selected since they were involved in the daily fit-for-work assessments of the STS crane operators. It was also decided to involve the safety, health, and environment (SHE) team, which was responsible for implementing occupational health and safety procedures throughout the company.

In this study, several important variables were noted and investigated. These variables included the informants' perspectives on, emphasising their ideas and encounters with occupational health and safety regulations. Additionally, by evaluating the opinions of STS operators on the benefits of fit-for-work monitoring tools for workplace safety, this study explored the effectiveness of these technologies.

Table 1. Details of Informants

Participants	Age (Year)	Sex	Role	Work Experience (Year)
P1	33	Male	STS Operator	6
P2	35	Male	STS Operator	5
P3	37	Male	STS Operator	4
P4	39	Male	STS Operator	5
P5	38	Male	STS Operator	4
P6	40	Male	STS Operator	5
P7	31	Male	STS Operator	5
P8	31	Male	STS Operator	5
P9	33	Male	STS Operator	4
P10	41	Male	Clinic Staff	6
P11	31	Male	Clinic Staff	6
P12	33	Female	Safety, Health, and Environment	4
P13	54	Male	Safety, Health, and Environment	5

Demographic information provided a profile of the informants, including age, sex, role, and years of experience. Patterns, themes, and insights were identified using qualitative data analysis from in-depth interviews and direct observations at the container terminal. Furthermore, the selected informants, including their roles and areas of expertise, were outlined and summarised. Details of the informants are shown in Table 1.

Data Analysis

The data were interpreted and examined using thematic analysis (Braun and Clarke, 2006). The researchers read the transcripts multiple times to familiarise themselves with the data and to identify and search for patterns of meaning and interesting themes in the data. Each code was assigned a colour, and marginal notes were added to the transcripts once codes were generated through discussion. The researchers identified and categorised all codes with similar meanings to construct groups. Following the link between categories, themes were also discovered and classified. The researches used an in vivo method, which provided verbatim transcripts of informants' responses, thereby allowing the researchers to identify some of the articles. The researchers subsequently compiled a narrative report supported by informants' responses as evidence of the data. After the data were analysed, a qualitative data triangulation was performed by sharing the drafted article with the container terminal authority to for data verification.

RESULTS

STS Operators' Emphasis on Productivity

The management's primary goals are to achieve efficiency and productivity. They closely monitor data to maintain quality, health, safety, security, and environmental standards. They consider even a single fatality as a negative event that can damage their reputation, regardless of the organisation's profitability. *"From a management perspective, we focus on maximising efficiency and productivity. We report data to the first commissioner every month. We must maintain a strong safety record, as even one accident can have a serious impact on our reputation and the parties involved. As a state-owned enterprise, our reputation is significant. Operational disruptions and dealing with the authorities become inevitable in case of a fatality or an incident such as container lifting. We strive to prevent such incidents to ensure the well-being of our employees and the satisfaction of our customers." (P13)*

Workflow efficiency is meticulously measured. This includes the docking time and the number of containers to be handled. The average number of boxes (containers) per hour is approximately 45 boxes per hour. This number is used to calculate the docking time scheduled for the next ship. If the time is extended, the company must pay the container owner for the delay. *"If there is a ship with 1,000 boxes, we will calculate the time to handle the boxes. The basic guideline is 45 boxes per hour. This number would then be the guide for the schedule of the next ship to be docked in this operation." (P13)*

Some conditions, such as the weather, cannot be predicted. During the rainy season, dry bulk handling operations may be postponed, and to compensate for the lost time, the operator works faster to pick up the dry bulk when conditions are suitable. *"For instance, the operation had to be stopped last night when it rained from 3 until 12 o'clock. The operators and crew members can rest, but they must catch up later." (P13)*

To achieve efficiency, the management also emphasises the importance of occupational safety and health. According to an informant, attention must be paid to occupational safety and security because human resources support the company's operations. *"So, there needs to be a balance between making the company more efficient and ensuring that the employees are healthy and safe. The problem is that it is impossible to have just one, especially since we are a high-risk company, so, like it or not, the safety and health aspects of workers are needed to continue to create an optimal and sustainable work environment." (P13)*

Based on the management's explanation, achieving business efficiency means addressing several OSH issues. Examining OSH issues is essential, especially for STS operators with higher work risk factors. The risk is a factor that increases focus because bad weather reduces visibility. *"I have to focus on the trolley, but I get tired if I focus too much. I have to adjust my focus depending on the size of the ship. If it is a small ship, I have to focus more. If the weather is terrible, we do not move. It's too dangerous." (P4)*

OSH Issues on STS Crane Operators

The STS crane operators reported higher fatigue levels, especially when handling many containers.

As a result, they needed more opportunities to take breaks or rest. *"Tired, the most tiring is when we are in the full position, we do not have time to chill." (P8)*

The informants also expressed feelings of fatigue and sleepiness, particularly during the night shift. An informant also mentioned the need to carefully organise and adjust their schedule to accommodate their work shifts and personal life. *"Working during vulnerable hours, like at night, can make us tired. It is better to work in the morning when we are more alert. We need to be extra careful and set aside certain hours for rest to take care of ourselves." (P9)*

STS operators have also reported experiencing headaches and migraines while operating the STS. These physical ailments interfere with their ability to perform their jobs effectively, leading them to seek evaluation and assistance from their colleagues to determine if they can continue working. *"Once someone had a headache, or migraine, right on top of that, colleagues picked them up." (P1)*

One informant mentioned that excessive focus can lead to feelings of tiredness, which can vary depending on the depth of the ship. International ships are typically deeper than domestic ones. Weather conditions also play a role, as bad weather can reduce visibility and require increased attention. *"Focusing too much can make us tired quickly. If the weather is bad and visibility is poor, we should stop and wait for it to improve. Heavy rain is also a reason to pause for safety." (P4)*

STS crane operators must maintain focus and professionalism despite facing mental fatigue and personal issues outside of work. *"Yes, it is important to be aware of our mental well-being. Operators should prioritise their mental health and take the necessary steps to address psychological issues." (P7)*

Factors Affecting Fatigue at Work

The work process of STS operators requires them to work with a high degree of speed and precision. As the workload increases, operators are expected to be available and on-call even during their off-duty periods and holidays. This indicates the high demand and continuous nature of their work, which requires them to be ready at all times to handle the workload efficiently. *"Operators rarely take sick leave because they need to monitor the ship's condition. If the ship is calm, they can be on standby from home instead of leaving. The frequency of these situations depends on the time of year, such as during busy periods like Christmas in China." (P8)*

Working as an STS operator requires focus when handling the containers, especially when transferring them to international ships with higher capacity and higher STS crane cabins. *"Focusing too much can make us tired quickly. To avoid this, we can concentrate on looking directly at the trolley or the task before us. This helps reduce fatigue. "(P4)*

Insufficient sleep can lead to fatigue. STS operators have a demanding job of loading and unloading cargo between ships and the shore, often under challenging conditions and strict time constraints. Therefore, adequate sleep is vital for the physical and mental well-being of STS operators. *"Operators often feel tired because their work schedule disrupting regular sleep patterns. Night shifts and spending time with their children when they return home can make it difficult to get regular sleep." (P8)*

STS crane operators who also play the role of fathers or heads of their families are faced with additional demands that can contribute to fatigue. Balancing their responsibilities at home and work can lead to increased tiredness and exhaustion. *"After finishing a night shift, operators must try to get some sleep. However, as a family-oriented person, there may be other responsibilities and demands. Despite these challenges, it is important to prioritise getting enough rest for overall well-being." (P3)*

Methods of Coping with Working Fatigue

When STS crane operators experience fatigue during working hours, they typically use strategies to alleviate it. This may include taking short breaks to rest their eyes or refreshing themselves by washing their faces. These quick rejuvenation techniques can provide a temporary boost and help them combat fatigue, allowing them to continue their work with improved alertness. *"I used to wash my face to overcome sleepiness, and sometimes I take a nap for around five minutes." (P9).*

Operating an STS crane requires high focus, attention, and coordination. Operators must stay hydrated while operating heavy equipment such as an STS crane. By drinking water, they can maintain optimal cognitive function and prevent dehydration, which can lead to fatigue, headaches, and dizziness. Operators prioritise staying hydrated because taking

a short break to drink water allows them to replenish quickly and potentially increase their productivity by handling more containers. *"I drink more every shift. Then, when I work, I usually work casually according to the essential procedures." (P9)*. *"When I am alone, the rest is just drinking. If we wait until the cargo is sent to us, it will be unfortunate. This is because we will share container boxes with other STS operators later. The more container boxes we lift, the more we earn. If we take a long time to rest, our income will be even less." (P1)*

Indonesia is a predominantly Islamic country, and religion holds significant importance in the lives of its people. Among STS operators, religiosity is an important coping mechanism when dealing with fatigue or work-related challenges. For instance, while working on the docks, workers often pray to find solace and seek guidance from a higher power. This practice stems from their belief in the supernatural forces that transcend human authority and provide them a source of strength and support. *"When the wind is strong, it (STS crane) shakes a lot. Usually, I pray because these are natural conditions. And it's out of our control; the rain, the wind. So, we pray to God. Hopefully, we will be safe." (P4)*

When experiencing fatigue from work, STS operators typically focus on optimising their body's capacity by adjusting their routines at home. One common approach is to increase their sleeping hours after work. For instance, they may schedule extra time to sleep, doubling the duration of sleep compared to their usual sleep schedule. This extended rest period allows them to replenish their energy and combat the effects of fatigue, allowing them to recover and be better prepared for subsequent work shifts. *"For example, sleeping only 6 hours is still not enough. So, we are sleepy and tired. So, I must sleep twice as much." (P2)*

Organizational OSH Culture

An essential aspect of ensuring OSH in container terminal companies is establishing a company clinic. The company clinic is a dedicated facility responsible for monitoring, screening, and providing recommendations regarding employee safety and health issues. This clinic plays a vital role in proactively addressing and managing potential risks and promoting a safe working environment for the employees within the company. *"The clinic's role is monitoring, screening, and providing recommendations. Screening is certain with earlier approval from the relevant department. As we scored earlier, the results did not agree with some of these high-risk workers. We recommended that we monitor medication, so we screened how many daily complaints there were, what the BMI was for the program, there had to be improvements, and not let the medical check-up, the score does not decrease, or is not improving." (P10)*

The company's commitment to prioritise the occupational health and safety of STS operators is reflected in the implementation of standard operating procedures. These include specific measures such as fit-for-work checks conducted at the company clinic before operators enter the dock area. Additionally, annual medical examinations are carried out to ensure the ongoing well-being and fitness of the operators. These practices demonstrate the company's proactive approach to maintaining a safe and healthy work environment for its STS operators. *"Yes, we check fit-for-work at the clinic every day before working. So, does he person fit for work or not? Before working, we come to the clinic by motorcycle. There is even a regular medical check-up activity in the 12th month. I suppose I have a medical check-up once a year. If the fit-for-work is not good, the standard operating procedures of our company require us to rest and recheck." (P9)*

Furthermore, the company offers a range of health and fitness facilities, including futsal and basketball courts, golf facilities, gyms, and more. These sports facilities are important in high-risk industries. They serve as spaces where safety culture and best practices can be promoted effectively. Employers can organise safety-related events and activities at these venues to raise awareness of safety issues and cultivate a strong safety culture among workers. By integrating safety initiatives with sports and recreational activities, companies can create an environment that fosters a proactive and safety-conscious mindset among their employees. *"The company does provide sports facilities. There is a gym here. There is a futsal and basketball court. The point is that the company supports sports. Especially for former athletes, you know, they need sports facilities." (P7)*

As part of their commitment to employee well-being and risk management, the container terminal company provides insurance coverage for employees who are exposed to high risks. In addition to the employees, this insurance also covers the members of their immediate family, which is normally limited to a spouse and three children. In the event of

occupational accidents or incidents, this insurance policy provides protection and financial support, acting as a preventive precaution and ensuring adequate coverage for employees and their families. *"The company has adequate insurance coverage. I work at my best because I have the best that the company offers." (P7)*

Through various initiatives, including safety workshops, container terminal companies encourage safety among STS operators. These courses cover important topics such as the proper use of personal protective equipment (PPE). By organising these workshops, companies aim to increase the knowledge and understanding of operators about safety protocols and equip them with the necessary skills to use PPE effectively. This proactive approach helps create a safety-conscious workforce and reinforces the importance of adhering to safety measures while performing their duties. *"Usually, once a year, the company conducts a workshop to employees about safety first. It is like using PPE on the part of the company." (P7)*

Personal OSH Culture

Employees understand that their health and fitness are crucial for their smooth work performance. They take personal steps such as exercising, eating well, and getting enough sleep to stay fit at work. *"Sometimes I play football with my friends here too." (P6). "The essential things to maintain health are lifestyles such as diet and exercise. Yes, it is called being tired from work. Usually, I do sports. Even that does not happen every day (laughs)." (P9). "Yes, no, it is self-awareness, not because of the company. Apart from that, a diet too. If the diet is not regulated, there will be many effects. So, it must also be maintained. We have been given work like this; do not take it easy." (P7). "If you take a break, it usually lasts for eight hours, so yes, I still have eight hours. Besides, as the operator, how must we be comfortable like that." (P7)*

STS employees show solidarity and support for each other in OSH matters. In the event of work accidents, they coordinate with the sub-manager and involve the company's OSH section for necessary actions and follow-up to assist the affected STS operator. *"The clinic contacts the sub-manager or sub-tender. So, report first. Not to the clinic. For example, if you are fine, keep walking, and participate in activities, how come you have high blood pressure, you will get dizzy, and there will be someone to pick you up at the pier. If someone is picked up by an ambulance, their friends usually replace them. They are friends. There are also foremen assistants." (P6)*

STS operators use WhatsApp groups as a communication medium. These groups serve as a source of communication for the operators, particularly in OSH. Within the group, workers can discuss and address issues related to work fatigue, fostering a culture of open communication and support among the operators. *"There is also communication between workers like handy talkie. There is also a WhatsApp group for the need for communication during work. The operator has its place and every month, there must be a WhatsApp group so we can get help with the shift in case of getting sick." (P1)*

Stakeholders' Views on Using Fit-for-Work Monitoring Technology

STS operator employees believe that the company must implement a monitoring system for assessing their fitness and fatigue levels. They emphasise the significance of such a system to ensure their well-being and safety during work. *"We want to monitor the level of fatigue." (P9). "Yes, supporting friends in monitoring their health at work is necessary. Yes, it is essential." (P2)*

While many STS operators recognise the significance of implementing a fit-for-work monitoring system, they also express concerns about the potential addition of new job responsibilities. *"The problem is just monitoring the clinic. We are worried about work. Keep looking at this (monitoring device). It is not effortless." (P6)*

STS operators also express concerns about their autonomy regarding the fit-for-work monitoring system. They feel that continuous monitoring restricts their freedom and independence. *"If we feel we are being watched, we will feel nervous, Sir. Never mind the tools, if you feel the CCTV (closed circuit television), the camera. Moreover, the tool monitoring is healthy or not? We are watching our movements. Moreover, the tool sticks. What if CCTV is like this, we already know, right? We have been monitoring it, right? Sometimes, what should you do if the detection tool enters your mind (laughs)." (P5)*

In addition to interviewing STS operators, discussions were held with employees at the company's clinic. Currently, the fit-for-work data in container terminal companies are manually recorded in Microsoft Excel. However, the clinic

staff expressed the need for a real-time worker information system in the form of an application. This system would simplify their work by continuously monitoring employee health and allowing easy access to company data. *"So far, our data collection system is still manual. For example, blood pressure data collection, blood pressure, everything is still manual. We wish there were a tool to make the data we collect later directly enter the application so that each person can record their medical history daily. So those of us who had to take a break today could get sick, but tomorrow, in two weeks, he will be healthy. We do not necessarily know if he is not fit because we must check again in two weeks. It would be easier for our work if we had this tool." (P11)*

According to the informants, implementing a fit-for-work monitoring system cannot be achieved by a single party alone. However, if such a system is established, the container terminal company intends to fully optimise it. They aim to ensure that all stakeholders within the company support and adhere to the standard operating procedures associated with the system. *"Once a fit-for-work monitoring system has been created, we will set the standard operating procedures. We will make every effort to maintain the OSH. On the one hand, we maximise employee productivity, especially STS operators. For the system, perhaps the safety, health, and environment division will be the controlling part, while the human capital division will be related to the reward and punishment. We will work as much as possible for this fit-for-work monitoring system to work here." (P10)*

DISCUSSION

STS Operators' Emphasis on Productivity and the Associated OSH Challenges

This study gained valuable insights from the broader manufacturing context, highlighting the critical role of occupational safety in shaping employee productivity (Obrenovic *et al*., 2020). The research findings highlight the need for all-inclusive safety programs that include ergonomics, emergency response, safety training, and risk transfer. These programs impact important variables such as productivity, job completion, and value-added. This correlation with the industry shows how workplaces, including container terminals, are becoming more complicated and posing new risks to worker productivity. The importance of upholding occupational health and safety is heightened by this complex environment, especially in high-risk sectors such as container terminals where STS operators are exposed to increased risk factors. Operators must pay more attention to these hazards because of external variables such as unfavourable weather conditions (Tseng and Pilcher, 2017).

Although the primary focus of this study is STS crane operators in container ports, the findings are relevant to industry concerns. The researchers agree that workplace safety precautions might not always protect workers from modern work risks, which could impact productivity. To overcome these obstacles, the container terminal industry must implement evidence-based tactics and learn from similar industries, such as mining (Bauerle *et al*., 2022). These techniques are extremely helpful in reducing the particular health and safety risks that STS operators face, particularly since they must balance strict work schedules with family responsibilities.

This study sheds light on a worldwide issue faced by various industries: increasing worker productivity while maintaining occupational safety and health, particularly in developing nations. These workplaces frequently require assistance with inadequate technology, ineffective management, skill-job mismatches, unclear responsibilities, harsh working conditions, and poor job design. These problems result in lower productivity, lower quality, higher prices, poorer worker health, and occupational injuries and disabilities. This study also emphasises the importance of using ergonomics or human factor principles, as suggested by Shikdar and Sawaqed (2003) to address these problems. They also explain that the effective application of ergonomics to work systems can balance worker capabilities and job demands, boosting productivity and improving well-being and job satisfaction. In simple terms, this study underscores the critical role of ergonomics in improving worker productivity, satisfaction, and overall company performance. As emphasised by Shikdar and Sawaqed (2003), neglecting ergonomics in the workplace makes it challenging to achieve organisational goals. Therefore, the findings of this study stress the importance of including ergonomics principles to address worker productivity and safety.

Factors Affecting Fatigue at Work

STS operators have a tough job at the container terminal. They must work quickly and precisely. When things get busy, they must be on-call even

during their time off. This shows how demanding their job is. Since they have to watch the ships, they do not frequently take sick leaves. They are given the option to work from home when business is slow, which demonstrates how adaptable they must be. In today's industries, worker fatigue is a prevalent issue frequently caused by demanding work schedules and changing work environments. Saito (1999) noted that fatigue is a multifaceted problem that results in weariness, decreased physical performance, autonomic nervous system abnormalities, and decreased productivity. This problem is exacerbated as employment transitions from physically demanding jobs to specialised occupations. This study highlights the importance of getting enough sleep for STS operators, especially when handling difficult cargo with limited time. Unfortunately, night shifts and family responsibilities frequently disrupt the sleep cycles of these operators, which contributing to their exhaustion. The findings of this study are consistent with those of Caldwell *et al*. (2019), who emphasises the value of sleep and the dangers of job exhaustion, including poor physical and mental health and accidents. To manage this issue effectively, evidence-based techniques such as scheduled naps, dedicated sleep time, regular breaks, and fatigue-sensing devices are essential (Caldwell *et al*., 2019). This underscores the importance of managing fatigue among STS operators.

Fathers, in particular, who work as STS crane operators, must deal with the additional difficulty of juggling work and family responsibilities. Based on the results of this study, this delicate balancing act may increase their fatigue. They struggle to get enough sleep after working night shifts and caring for their families. This underscores the importance of prioritising rest for their health and to reduce fatigue. The findings also underscore the need for the container terminal industry to adopt tactics from other sectors, such as mining, where workers similarly suffer from fatigue due to tedious duties and distinct work environments (Bauerle *et al*., 2022).

Methods of Coping with Working Fatigue

This study found that STS crane operators have ways to combat fatigue. They take short breaks to rest their eyes and refresh themselves by washing their faces. This helps them regain some energy and focus. Drinking water is also crucial for them as it keeps them thinking and prevents dehydration, which can lead to tiredness and other issues. They also pray for strength when things get tough at work, which is essential for their well-being. To recharge, they sometimes sleep more after their shifts. These strategies are similar to those used by others. For instance, Lu *et al*. (2017) found that people respond to fatigue by drinking caffeinated beverages and talking to colleagues.

The strategies found in this study are similar to those people use to cope with work-related stress. Menardo *et al*. (2022) mentioned two main areas affected by stress: employee well-being and company productivity. The coping strategies of STS operators can help in both areas by making them more resilient and productive. Mindfulness practices, highlighted by Menardo *et al*. (2022), are also related to what STS operators do to take care of their mental and physical well-being.

The maritime industry has unique challenges when it comes to worker fatigue. Shift work is common, and seafarers often need more time to rest. The data confirm these challenges and highlight the importance of making the most of limited rest time (Ohayon, Smolensky and Roth, 2010). Work patterns in the maritime industry can lead to varying levels of fatigue. The short sea sector, for example, can cause more fatigue due to increased workload and frequent port stops (Jepsen, Zhao and van Leeuwen, 2015)

OSH Culture

At a high-risk container terminal company, safety is a big issue. They have a company clinic for regular health checks, sports facilities, and safety workshops. Employees also take care of their health with exercise and a good diet. When accidents do happen, STS employees support each other through WhatsApp groups, creating a culture of mutual help and teamwork. These findings are consistent with existing literature on safety culture, which defines it as shared attitudes, values, and perceptions towards safety within organisational groups. Safety culture is increasingly recognised as a driver of organisational safety outcomes, with regulators in various industries emphasising its importance (Nævestad *et al*., 2019; Cunningham *et al*., 2020; Tear *et al*., 2020). This study also reflects the role of corporate strategies in OSH culture. The company's emphasis on risk assessment, control implementation, and risk management is consistent with the findings of this study on the commitment to OSH values and principles. However, there may be room for improvement in translating this commitment into worker representation and consultation institutions (Walters and Wadsworth, 2022).

The safety management strategies observed at the corporate level are consistent with a systematic approach to risk assessment, encouraging worker involvement in safety practices and ensuring the provision of necessary safety information. This approach creates a safe work environment by creating a physical separation between workers and equipment while prioritising hazard prevention (Walters and Wadsworth, 2022). By addressing the underlying causes of mishaps, safety culture has gained international recognition as a successful technique for preventing major accidents (Cooper, 2000; Tetzlaff *et al*., 2021). Individual characteristics such as personal belief, prior experience, technical competence, and organisational characteristics, such as commitment to safety, accepted social norms, and the importance of safety concerns, all influence safety culture (Tetzlaff *et al*., 2021). Building a strong safety culture requires the support from leadership and management (Berglund *et al*., 2023).

Stakeholders' Views on Using Fit-for-Work Monitoring Technology

To ensure that employees can perform their duties safely and are fit for duty, container terminals must have fit-for-work monitoring systems. By assessing the mental and physical well-being of workers before and during employment, these systems help lower the likelihood of accidents and injuries (Qiu, Zhu, and Lu, 2021). Maintaining employee well-being requires regular health exams, training, and the provision of protective equipment (Etemadi *et al*., 2016). Additionally, it is important for employers to create a culture of safety that motivates employees to disclose any health problems.

Operator fatigue is a major problem in the STS industry, affecting productivity and safety (Fang *et al*., 2018). Extended workdays and irregular shift schedules can lead to operator fatigue, resulting in mishaps, injuries, and damage to cargo or equipment. Adopting wearable sensors and automated equipment that track vital signs and alert users to exhaustion are two ways technology can reduce fatigue (Mohsawrab *et al*., 2022). However, combating operator fatigue requires a multifaceted strategy that includes advanced technology, regulations limiting work hours and shift patterns, and thorough operator education and training.

CONCLUSION

Several conclusions can be drawn from the results of this study. First, companies that specialise in container terminals place a high priority on workplace safety and health as well as productivity. These are two of the most important things for STS operators to consider. Second, physical and psychological difficulties are among the health issues that STS operators are prone to. The causes are the fast-paced work system, erratic sleep patterns, arduous daily duties, and uncontrollable thoughts. Workers have a variety of coping techniques, including praying and taking short breaks. Third, various key stakeholders, including business management and STS operators, have successfully communicated the OSH culture of container companies. Fourth, most people interested in a container terminal want a fit-for-work monitoring mechanism to ensure that the businesses they help build are successful and sustainable. Addressing this issue requires a multifaceted approach that includes regulations governing working hours and shift patterns, the use of technology to mitigate fatigue, and education and training for operators. Based on its uncovered findings, this study recommends a fit-for-work monitoring system for STS operators.

ACKNOWLEDGEMENT

The authors wish to acknowledge the funding provided by the Directorate General of Higher Education, Research, and Technology of the Ministry of Education, Culture, and Research through the Kedaireka Matching Fund program.

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