

APPLICATION OF SYSTEMATIC CAUSE ANALYSIS TECHNIQUE (SCAT) IN PREPARING SAFETY STANDARD OPERATING PROCEDURES AT PT HOK TONG

Budi Aswin¹, Abdul Manab², Rizalia Wardiah¹

¹Public Health Sciences Study Program, Universitas Jambi, Indonesia

²Faculty of Science and Technology, Universitas Jambi, Indonesia

Abstract

Occupational accidents continue to occur in industrial environments, indicating gaps in workplace safety management and preventive controls. This study applies the Systematic Cause Analysis Technique (SCAT) to identify the root causes of work accidents and to develop safety standard operating procedures (SOPs) at PT Hok Tong. This research aims to analyze the application of the Systematic Cause Analysis Technique (SCAT) method in preparing work safety Standard Operating Procedures (SOP) at PT. Hok Tong Jambi, a natural rubber processing company that faces significant safety risks for its workers. Data was obtained through field observations, in-depth interviews with HSE staff and production workers, as well as reviewing work accident documents. Analysis using the SCAT model identifies the root causes of work accidents, including negligence, non-compliance with SOPs, and lack of adequate use of Personal Protective Equipment (PPE). This research found that factors such as lack of safety awareness, less than optimal supervision, and inconsistent implementation of SOPs were the main causes of work accidents in this company. Based on the results of the SCAT analysis, work safety SOPs were prepared as an effort to prevent and control work accidents, with the hope of increasing worker awareness and safe behavior. This research suggests strengthening supervision and more intensive safety training to minimize the risk of workplace accidents.

Keywords: SCAT, Work Accidents, Work Safety SOPs

Corresponding Author : Budi Aswin

Email: budiaswin@unja.ac.id

Article Received : September 03, 2025

Article Revised : November 27, 2025

Article Published : November 30, 2025

INTRODUCTION

There are at least a thousand times more non-fatal occupational accidents than fatal occupational accidents each year. The ILO estimates that at least 374 million workers experience non-fatal accidents every year, and the impact of this large number of occupational accidents is a serious consequence of reduced labour income. It is estimated by the ILO to lead to high loss of working time, disruption of production, reduced employee productivity, reduced company profits and high compensation costs to the families of victims (1).

Security and protection factors are factors that affect employee performance, if employees feel safe and comfortable, then they will work with a calm feeling and work well (2). The level of risk in the workplace that has the potential to cause accidents is influenced by the type of production, technology and materials used, healthy or hazardous work environment and the quality of OHS management in the workplace. In the Jambi area in 2017 there were 818 cases of work accidents, then 1,257 cases in 2018, in 2019 there were 1,765 cases of work accidents and in 2020 there were 1,905 cases of work accidents (3).

The principle of SCAT root cause analysis is to estimate the possible causes of an incident. The analysis uses a checklist that is structured based on the form of the incident, the losses that may occur if uncontrolled, the immediate cause, the underlying cause, and the

system required for control. Root cause tracing is done systematically by cross-linking several factors in a row (4).

According to Casban (2018), the analysis of work accidents in the container washing process in the cleaning division using the SCAT method shows that the application of OHS is not up to standard. Work instructions are not consistently implemented, and awareness of the use of PPE is still low. To reduce the risk of accidents, it is necessary to increase worker awareness through OHS training for new and old operators, establish an OHS department, and provide PPE that is comfortable and resistant to chemicals according to the risks involved (5). According to Khaira (2021), SCAT (Systematic Cause Analysis Technique) is a method developed by International Loss Control (ILCI) to identify and evaluate work accidents by identifying the direct cause, basis, and description of the incident. SCAT must be applied in conjunction with other methods and focuses on finding the root causes of accidents at the management level, so the SCAT chart only identifies deficiencies in management policy elements in occupational safety (6).

The results of research by Sulistyowati and Sukwika (2022) using SCAT obtained information about cases of causes of accidents such as lower back pain due to the burden of goods, hands stabbed by kape and pinched *table lifter*, fingers cut by razor blades / *cutter* blades and pinched LLDPE / *niproll*, head hit the corner of the *exhaust cover*, eyes exposed to *copper* liquid and exposed to *strapping bands* (5). (*unsafe action*) which ignores safety in order to do work quickly and ignore the standard equipment used. *Unsafe conditions* that do not pay attention to work areas that have hazards that pose a high risk to work safety (7).

The results of Lestari's research (2022) based on the SCAT model at the PT Bayung Agro Sawita palm oil mill found that work accidents occur as a result of *unsafe* behaviour (*unsafe action*) which ignores safety in order to do work quickly and ignore the standard equipment used. The results of Lestari's research (2022) based on the SCAT model at the PT Bayung Agro Sawita palm oil mill found that work accidents occur as a result of *unsafe* behaviour (*unsafe action*) which ignores safety for the sake of doing work quickly and ignoring the standard equipment used. *Unsafe conditions* that pay little attention to work areas that have hazards that pose a high risk to work safety. PT Hok Tong Jambi is a natural rubber processing company that processes slab/cup lumb raw materials into crumb rubber. This semi-finished product is used in the finished goods industry such as tyres, medical devices, and household appliances. The production process consists of purchasing raw materials, wet and dry processing, quality testing, storage, and export. During the work process, there are various safety and health risks for workers, such as physical, chemical, and ergonomic hazards (8).

According to accident data reports at PT Hok Tong Jambi, in 2019 there were 10 work accidents, increasing significantly from only 3 cases in 2018. In 2020 (January–September), 4 work accidents were recorded, followed by 5 cases in 2021 and 6 cases in 2022. The recurring and fluctuating number of accidents over the years indicates that the implementation of the occupational safety program at PT Hok Tong Jambi has not been carried out optimally. This situation highlights an urgent need for in-depth research to evaluate the effectiveness of the company's occupational safety and health (K3) practices, especially considering that the reported accident rates are still not aligned with government policy aims, which target a zero-accident workplace. (9)

Based on an initial survey conducted with 10 production workers at PT Hok Tong Jambi, several types of work accidents were reported, including falls, hand injuries from knives, and incidents involving conveyor machinery. These preliminary observations suggest that unsafe actions and inadequate attentiveness may contribute to the occurrence of such accidents. However, the initial survey does not provide sufficient evidence to determine the underlying causes comprehensively. Therefore, a more systematic and in-depth study is needed to investigate the factors contributing to work accidents and to clarify the extent to which worker behavior, workplace conditions, and existing safety practices influence these incidents. In-depth investigations are needed to identify the factors that contribute to unsafe conditions and unsafe actions, so that similar or other accidents can be prevented in the future. Therefore, this study aims to apply the Systematic Cause Analysis Technique (SCAT) to analyze the root causes of work accidents and to develop safety standard operating procedures (SOPs) at PT Hok Tong as a preventive measure to enhance occupational safety performance.

METHODS

The research used is qualitative research aimed at applying the Systematic Cause Analysis Technique (SCAT) model in the preparation of work safety SOPs. This study was conducted at PT Hok Tong Jambi, Jambi Province, from April to November 2024. The informants consisted of 1 key informant (HSE staff) and 2 production workers who had direct experience with the work processes and accidents being analyzed. The selection of these informants was based on purposive sampling, considering that they possess relevant knowledge, firsthand experience, and responsibility related to occupational safety. Although the number of informants is limited, in qualitative research the adequacy of data is determined by information richness, not quantity. In this study, the data obtained from the key informant and workers were sufficiently detailed and repetitive, indicating that thematic saturation had been achieved.

The research began with observations of the work environment and continued with the collection of primary and secondary data obtained from field studies, in-depth interviews with workers who experienced work accidents, and company documents such as accident reports and investigation records. After all data were collected and transcribed, analysis using the Systematic Cause Analysis Technique (SCAT) was conducted to identify the root causes of past work accidents. The results of the SCAT analysis serve as the basis for preparing the Work Safety SOP at PT Hok Tong Jambi.

RESULTS

A. SCAT

From the analysis conducted using the SCAT method, several factors contributing to occupational safety risks were identified, such as negligence, non-compliance with Standard Operating Procedures (SOPs), and insufficient Personal Protective Equipment (PPE) used to protect workers from hazardous particles. The first case highlights workers' lack of caution when walking, where they should be more aware of their surroundings to prevent potential hazards. Meanwhile, the second case shows that the negligence of other motorists also has a significant impact on individual safety. In addition, the slippery road conditions at the scene

were another factor that exacerbated the accident risk in this case. Therefore, further efforts

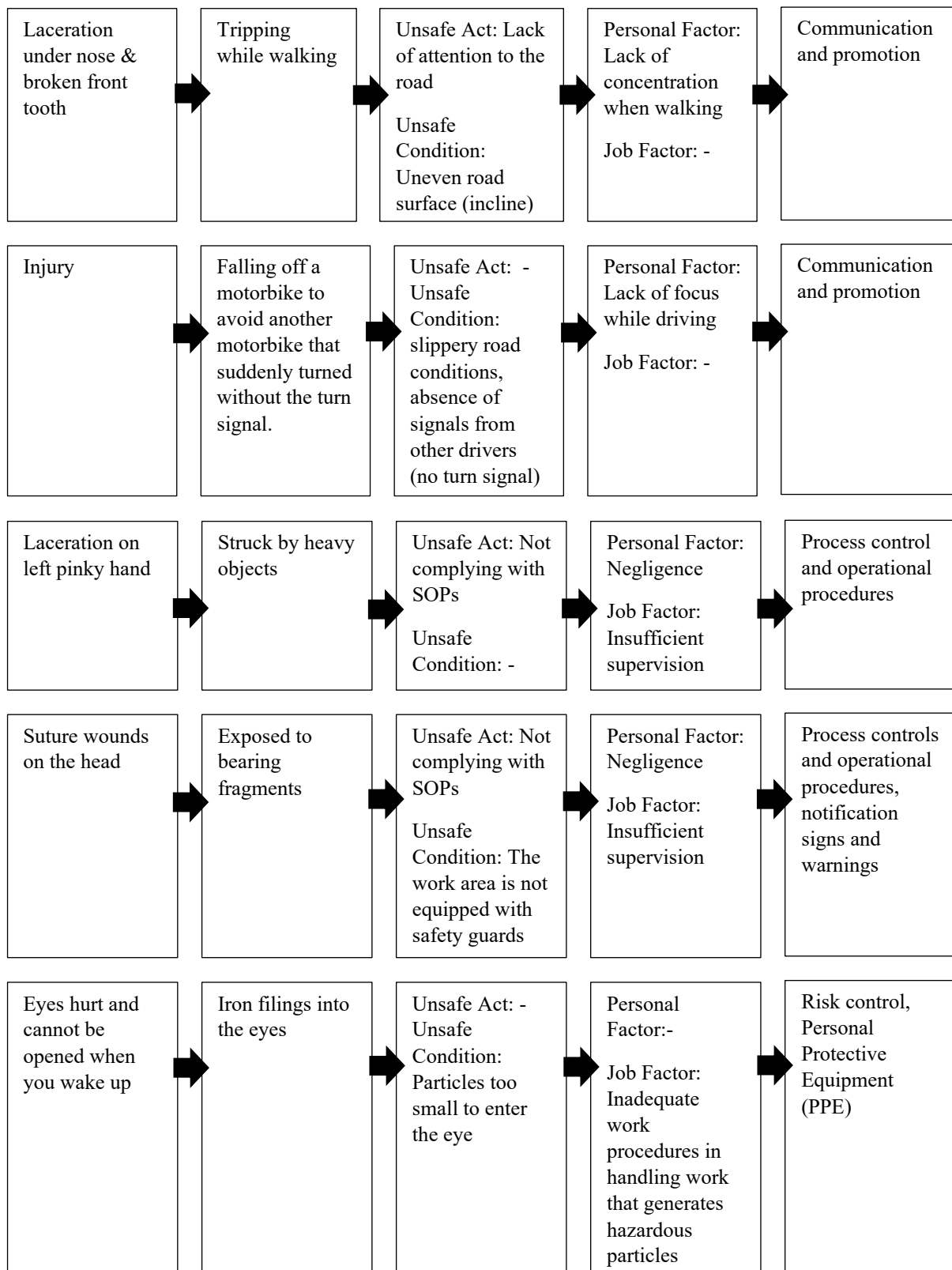


Figure 1. SCAT on PT, HOK TONG

should be made to raise workers' and drivers' awareness of the importance of caution and strict implementation of SOPs to minimise the risk of accidents in the work environment.

In the third case, the worker was hit by a heavy object because he underestimated his work and lifted the object using one hand. This shows that the worker did not comply with the existing SOP, which was repeated in the fourth case. In the fourth case, the worker did not follow the SOP, causing him to be hit by a broken bearing. Other workers had reminded him not to stand in the area, but the worker took it lightly and continued to stand there. Inadequate supervision was also a factor in the accident.

Supervision as a reinforcing factor in the formation of new behaviour is proven to have a significant influence on the habit of using the correct PPE. Supervision plays an important role in influencing workforce behaviour. Workers who serve as role models must have a strong leadership spirit, which includes the courage to reprimand or remind colleagues who neglect to use PPE while working.

Although safe and reliable systems and operations have been established, without adequate coaching of workers, deviations will still occur. Every worker must internalise a safety culture so that in every task and operation, safety is always a top priority by applying safe work behaviour. However, in the field, there are still many workers who exhibit risky behaviour.

In the fifth case, there was an incident where iron filings entered a worker's eye while he was grinding iron. Although the worker was wearing Personal Protective Equipment (PPE), small particles can still penetrate the protection and cause injury. This demonstrates the importance not only of wearing PPE, but also the need for companies to conduct a thorough evaluation of work procedures and methods that generate hazardous particles. Companies should improve workplace safety standards, including providing better training on the use of PPE and conducting close supervision of activities that could potentially endanger workers' health.

B. Standard Operating Procedure (SOP)

The preparation of (Standard Operating Procedures) SOP is one of the important things to maintain product quality and consistency (10). *Standard Operating Procedure (SOP)* is the main reference regarding the stages related to work activities in a company (11).

Management of Lacerations Under the Nose and Fractured Front Teeth

If a worker has an accident in the form of a laceration under the nose and a broken front tooth due to tripping, the first step is to stop work activities and immediately report to the immediate supervisor. Workers or witnesses at the accident site should immediately provide first aid by cleaning the wound using clean water or antiseptic and pressing the wound area with a sterile cloth to stop the bleeding. Injured workers should be immediately taken to the nearest health unit or hospital for further treatment, especially for professional medical treatment of broken teeth and facial injuries. After receiving treatment, workers should report the accident to the company's OHS team for investigation and recording, and obtain applicable compensation rights in accordance with company regulations and labour laws. (12)

Management of Injuries Due to Falling from a Motorbike in a Work-Related Traffic Accident

If a worker experiences a traffic accident in the form of an injury resulting from falling from a motorbike while performing work-related duties or during an official work trip assigned

by PT Hok Tong, the incident is categorised as a work accident under company responsibility. In such cases, the worker must immediately stop all activities and report the incident to their direct supervisor and the OHS team. If the worker is still able to move, they should seek a safe location and request assistance from nearby individuals or authorities such as traffic police to ensure appropriate handling at the scene.

First aid should be provided based on the worker's condition, such as avoiding movement if a fracture is suspected, and promptly contacting an ambulance or going to the nearest hospital for medical treatment. The OHS team must then be informed to conduct documentation, investigation, and administrative processing related to the incident, including verification of work accident insurance eligibility and fulfilment of compensation rights according to company regulations and prevailing labour laws. (13)

Management of a laceration of the little finger of the hand caused by a heavy object

If a worker experiences a work accident in the form of a laceration to the little finger of the hand due to being hit by a heavy object, immediately stop the work activity and report the incident to the immediate supervisor and the OHS team. Workers or witnesses on site should immediately provide first aid by cleaning the wound using clean water or antiseptic, then pressing the wound with a sterile cloth to stop the bleeding. If the injury is severe enough or there is a suspicion of damage to the finger structure, the worker must be immediately taken to the nearest medical facility for further treatment. After receiving medical treatment, workers must report the details of the incident to the OHS team for the purposes of investigation, record-keeping, and filing work accident insurance claims. In addition, the OHS team must also ensure that preventive measures are implemented to prevent similar accidents from happening again in the future, in accordance with the company's safety procedures. (14)

Treatment of Stitched Wounds on the Head Caused by Shards of Bearing Resistance

In a situation where a worker suffers a workplace accident due to being hit by a bearing shard resulting in a stitch wound to the head, the first step should be to immediately stop activities around the scene and ensure the safety of everyone in the vicinity. After that, the injured worker should be immediately taken to the nearest medical facility for first aid. The medical team should conduct a thorough evaluation of the wound, clean the affected area, and if needed, perform stitches to close the wound. In addition, it is important to record all details of the incident in a work accident report and report it to the employer and the company safety team. The injured worker should also receive psychological support if needed, and the company will evaluate its safety procedures to prevent similar incidents in the future.

Treatment of Eye Injury Due to Iron Powder Ingestion

If a worker suffers a workplace accident resulting in an eye injury due to iron filings, the first step should be to immediately stop all activities in the area and ensure the safety of other workers. The injured worker should be directed not to rub or touch the injured eye, and immediately run clean water into the affected eye for at least 15 minutes to remove the iron filings. After that, the worker should be immediately taken to the nearest health unit or medical facility for further examination and treatment by medical personnel. All details of the incident should be recorded in a work accident report and reported to the supervisor and the company's

safety team. In addition, the company will evaluate the cause of the incident and implement preventive measures to avoid similar incidents in the future.

DISCUSSION

The SCAT analysis at PT Hok Tong Jambi identified that most workplace accidents stemmed from unsafe acts (carelessness, SOP violations), unsafe conditions (uneven surfaces, lack of protective guards), and management-related factors (insufficient supervision). These results are consistent with Casban (5) and Sulistyowati & Sukwika (7), who found low awareness of PPE and neglect of safety instructions as leading causes of accidents. This is also in line with the study of Widyadhana & Apsari (6), which emphasized that SCAT is effective for identifying the root causes of workplace accidents by revealing deficiencies in management safety systems and unsafe behaviors among workers.

The recurrence of SOP violations suggests gaps in worker discipline and supervision. Inadequate supervision has been shown to significantly influence PPE usage and safety behavior. This finding aligns with previous research showing that monitoring and supervisor enforcement are key determinants of compliance. According to Okta Kurniawan (2), a safe and secure work environment has a strong impact on employee awareness and performance, indicating that safety culture is closely linked to management attention and control. Therefore, strengthening supervision mechanisms is essential to ensure adherence to safe work procedures, as also supported by Yuli et al. (3) who emphasized the importance of management's role in improving safety performance through consistent supervision and reporting systems.

The results of this study are reflected in the development of the Standard Operating Procedures (SOP) related to accident case management. For instance, the SOP for laceration under the nose and fractured front teeth due to tripping emphasizes immediate cessation of work, first aid, reporting mechanisms, and medical referral. This structured response not only supports timely recovery but also ensures systematic documentation for accident investigation. The inclusion of this reporting chain demonstrates the company's shift toward more accountable and traceable incident handling. This finding supports the statement of Nabilla & Hasin (15) that effective SOP implementation strengthens consistency, accountability, and procedural discipline within organizations.

Likewise, the SOP for motorcycle-related injuries during work travel integrates both emergency medical response and administrative handling of compensation claims. This highlights that accident risks related to mobility are acknowledged as part of occupational hazards and therefore must be managed within the OHS system. It also reflects improved coordination between supervisors, the OHS team, and external emergency services. This is consistent with Yuli et al. (3), who stated that accident prevention requires integration between internal company safety systems and external institutions such as health services and insurance providers to ensure complete management of occupational risks.

In cases such as hand lacerations caused by heavy objects and head injuries from bearing fragments, the SOP emphasizes the importance of proper first aid, evaluation of wound severity, and referral to medical facilities. Additionally, the requirement to conduct accident investigation and follow-up corrective measures illustrates a shift from reactive to preventive safety management. These procedures encourage learning from incidents and reinforce that

unsafe acts (e.g., handling materials incorrectly, ignoring machine safety zones) must be corrected through training and behavioral reinforcement. This is in accordance with the findings of Ilmansyah et al. (16), who found that the application of structured analysis methods such as Job Safety Analysis (JSA) and SCAT fosters a proactive safety culture and reduces repetitive accident patterns in industrial workplaces.

Moreover, the SOP addressing eye injuries caused by iron filings demonstrates the importance of appropriate PPE selection and suitability assessment. Although PPE was available, the incident indicates that either the PPE was not sufficiently protective or work procedures around particle-generating tasks were inadequate. Therefore, periodic evaluation of PPE specifications and suitability testing becomes essential to ensure protection matches the actual hazard level. This is consistent with WHO (17), which highlights that PPE effectiveness depends on proper hazard assessment, continuous evaluation, and employee training to ensure correct use in industrial environments.

Beyond the treatment procedures, this study also revealed that musculoskeletal complaints (back and ankle pain) were frequent, pointing to ergonomic issues not fully addressed in current SOPs. Strengthening ergonomics within SOPs, such as safe lifting techniques, workstation design adjustments, and scheduled stretching, could reduce such risks. This aligns with the study of Sumarni & Siwi (18), who demonstrated that ergonomic interventions such as workplace exercise and posture correction can significantly prevent musculoskeletal disorders (MSDs) among manual labor workers. Similarly, Ridlo & Fasya (19) and Sholeha & Sunaryo (20) found that ergonomic improvements and rest intervals play a crucial role in minimizing fatigue and injury among industrial workers.

Overall, the development and application of the SOPs highlight the importance of improving safety culture within PT Hok Tong. Workers need to internalize safe practices not only because procedures require them, but because such practices are recognized as essential to personal safety. Leadership commitment, consistent monitoring, regular training, and reinforcement through feedback are critical to building a work environment where safety is practiced consistently, not situationally. This supports the findings of Widyadhana & Apsari (6), who noted that the establishment of a safety culture requires both management commitment and active worker participation through continuous training and feedback.

Therefore, the findings emphasize that risk control must not only focus on the availability of PPE and procedures but also on worker behavior, supervision effectiveness, and continuous evaluation of work conditions. This integrated approach is essential to reducing accidents in the rubber processing industry. These findings are consistent with the study by Lestari (8) at PT Bayung Agro Sawita, which utilized the SCAT model and found that workplace accidents occurred due to unsafe behavior, such as ignoring safety procedures to complete work quickly and neglecting the use of standard equipment. This similarity indicates that workers' tendency to prioritize efficiency over safety remains a major challenge in the manufacturing and processing industries.

CONCLUSION AND RECOMMENDATION

The application of the Systematic Cause Analysis Technique (SCAT) at PT Hok Tong Jambi identified several factors contributing to workplace accidents. These include unsafe acts such as carelessness and violations of Standard Operating Procedures (SOPs), unsafe

conditions such as uneven walking surfaces and the absence of machine safety guards, as well as management-related factors, particularly insufficient supervision in several cases.

The findings show that repeated non-compliance with SOPs and negligence are the dominant immediate causes of accidents, while gaps in supervision contribute to the recurrence of unsafe behaviors. In addition, some working conditions, such as exposure to small metal particles during grinding activities, indicate inadequate work procedures related to the control of hazardous materials.

Based on these findings, preventive efforts should prioritize strengthening worker compliance with SOPs, improving supervision, and enhancing the correct and consistent use of Personal Protective Equipment (PPE). Continuous evaluation of work procedures is also necessary to ensure that potential hazards are adequately controlled. These measures are expected to reduce the risk of accidents and support the development of a safer work environment at PT Hok Tong Jambi.

REFERENCES

1. International Labor Organization. Kantor Perburuhan Internasional, Geneva; 2018.
2. Okta Kurniawan A. Occupational Safety And Health: The Effects Of Challenges And Employee Awareness. *Management Studies and Entrepreneurship Journal*. 2023;4:7090–100.
3. Yuli A. Profil Keselamatan dan Kesehatan Kerja Nasional Indonesia Tahun 2022. 2022.
4. Alwie RDDDAF, Prasetio AB, Andespa R. Tugas Akhir. *Jurnal Ekonomi*. 2020;18(1):41–9.
5. Casban. Analisis Penyebab Kecelakaan Kerja Pada Proses Washing Container di Divisi Cleaning. *JISI Jurnal Integrasi Sistem Industri*. 2018;5:111–21.
6. Widyadhana AN, Apsari AE. Analisis Keselamatan dan Kesehatan Kerja dengan Metode HIRA dan SCAT (Studi Kasus PT X). *COSM Journal Teknik*. 2023;1:25–34.
7. Sulistyowati I, Sukwika T. Investigasi Kecelakaan Kerja Akibat Alat Pelindung Diri Menggunakan Metode SCAT dan SMART-PSL. *Jurnal Ilmu Kesehatan Bhakti Husada*. 2022;13:27–45.
8. Lestari P. Identifikasi Bahaya Menggunakan Metode JSA dan SCAT pada Pekerja Proses Produksi. 2022.
9. Natural Rubber Producing Countries. ANRPC; 2019.
10. Setiawan MH, Komarudin R, Kholifah DN. Pengaruh Kepercayaan, Tampilan dan Promosi terhadap Keputusan Pemilihan Aplikasi Marketplace. *Jurnal Infortech*. 2022;4:141.
11. Nurkholis N, Adriansyah G. Pengendalian Bahaya Kerja dengan Metode Job Safety Analysis pada Penerimaan Afval Lokal. *Jurnal Teknik Engineering Sains*. 2017;1:11.
12. Citra R, Sandi SP. Penerapan Standar Operasional Prosedur pada UMKM Peci Anyaman Bambu. *ABDIMA Jurnal Pengabdian Mahasiswa*. 2023;2:3482–8.
13. Indriyanti LA, Prastawa H. Analisis Risiko Kerja Menggunakan Job Safety Analysis dengan Pendekatan HIRARC. *Industrial Engineering Online Journal*. 2024;13:1–11.
14. Widari NS, Nurhayati L. Pengendalian Risiko K3 pada Industri Kecil Keripik TWM dengan Metode Job Safety Analysis. *Journal of Industrial View*. 2024;6:11–20.
15. Nabilla DR, Hasin A. Analisis Efektivitas Penerapan SOP pada Departemen Community & Academy RUN System. 2022;1:58–75.
16. Ilmansyah Y, Mahbubah NA, Widyaningrum D. Penerapan Job Safety Analysis sebagai Upaya Pencegahan Kecelakaan Kerja. *PROFISIENSI*. 2020;8:15–22.
17. Musculoskeletal Condition. WHO; 2021.

18. Sumarni T, Siwi AS. Senam Ergonomi untuk Mencegah Keluhan Musculoskeletal Disorders. *Jurnal Pengabdian Masyarakat PIMAS*. 2022;1:73–81.
19. Ridlo AJ, Fasya AHZ. Gambaran Keluhan Musculoskeletal Disorder pada Pekerja PDKB PT PLN. *Sehat Rakyat Jurnal Kesehatan Masyarakat*. 2023;2:258–66.
20. Sholeha N, Sunaryo M. Gambaran Keluhan Musculoskeletal Disorders pada Pekerja UD.X. *Jurnal Kesehatan Masyarakat*. 2022;10:70–4.