Improvement Of Occupational Health And Safety (OHS) System Using Systematic Cause Analysis Technique (SCAT) Method In CV. Wira Vulcanized

M. Rizky
Student at Industrial Engineering
Universitas Islam Negeri Sultan Syarif Kasim, Indonesia
mhdrizky6767@gmail.com

Muhammad Nur, Muhammad Ihsan Hamdy, Anwardi, Ismu Kusumanto, Muhammad Rizki, Nazaruddin
Assistant Professor at Industrial Engineering
Universitas Islam Negeri Sultan Syarif Kasim, Indonesia
muhammad.nur@uin-suska.ac.id, ihsanhamdy@ymail.com, Anwardi@uin-suska.ac.id, ismu_uin@yahoo.co.id, Muhammad.rizki@uin-suska.ac.id, nazar.sutan@uin-suska.ac.id

Abstract

CV. Wira Vulcanized is a company engaged in tire vulcanization. The company was established on December 5, 2012. CV Wira Vulcanized has 16 workers who start working from 08:00-17:00. Work carried out on the floor of tire vulcanizing production will not escape work accidents. The workers cause many accidents on the production floor for not complying with OHS regulations. The work accident caused the company a loss of time and also a loss of income. To solve problems that occur in CV. Wira Vulcanized is proposed to improve the work system using the Systematic Cause Analysis Technique (SCAT) method. This method is one of the methods to identify the cause of the work accident from the actual picture so that it can be known as a picture of the direct cause and the root cause. The conclusion of this study is. The Frequency Rate (FR) of work accidents for everyone million human hours worked from 2018 to 2020 was 131. Meanwhile, the Severity Rate (SR) is 125 days lost for one million hours worked. The most common causative factors are hazardous to work equipment (Sharp Blades), not using PPE, exposure to tire debris, being hit by heavy loads, and slipping. Proposed improving the Occupational Health and Safety (OHS) system on CV.Wira Vulcanized in order to minimize work accidents, making OHS SOP, adding OHS signs, routinely conducting OHS training, and tightening supervision of the use of PPE.

Keywords

Occupational Health and Safety (OHS), Systematic Cause Analysis Technique (SCAT), Personal Protective Equipment (PPE), Frequency Rate (FR), Severity Rate (SR)

1. Introduction

Technological advances in the industrial sector have developed very rapidly, so to face fairly fierce competition, it is necessary to increase the quantity and quality of production by efficiently utilizing resources, as a consequence, companies need to emphasize the role of Occupational Health and Safety (OHS).

Occupational Health and Safety is important for companies because the impact of accidents and occupational diseases harms the workforce and the company, either directly or indirectly. Occupational safety means the process of planning and controlling situations that have the potential to cause work accidents through the preparation of standard operating procedures that become a reference in work (Suma'mur, P. K, 1996 in casban, 2018). So OHS is a scientific field that studies the factors that cause an accident from the workplace and what efforts can be made to make a work accident on a CV. Wira Vulcanized can be minimized as small as possible.

CV. Wira Vulcanized is a company engaged in tire vulcanizing. This company has been operating for almost 9 years, precisely on December 5, 2012, located at Jalan Garuda Sakti KM.4, Simpang Baru Village, Tampan District. The owner of Wira Vulcanized is Mr. Agus Suprihanto. In running this vulcanizing business, there are 16 employees who work to meet consumer demand and comfort. The working hours of employees at CV.Wira Vulcanized are from 08.00 to 17.00 with a total working hours of 8 hours.

The results of field studies show that the production floor on CV.Wira Vulcanized is not safe. There is a cover maker on the machine that opens can cause workers to be electrocuted and it can also be seen that some workers when working do not use protective glasses where tire powder will enter the eyes and irritate the eyes. It can also be seen that workers use cellphones when doing their jobs, this is really dangerous. it can also be seen that there are piles of tires which can fall on workers at any time in conditions above the worker also does not use a safety helmet so that the risk is greater if hit. Workers also do not use safety shoes that allow heavy loads to fall on the workers' feet and workers also do not use gloves which can cause scratched hands. The work area of CV.Wira Vulcanized is also dangerous such as slippery floors and raw materials scattered everywhere. When the field survey was carried out, it was seen that some workers did not wear clothes when working. This shows that workers' knowledge in using PPE is still relatively low and there is no OHS SOP (Standard Operational Procedure) and OHS display on the CV.Wira Vulcanized.

As a result of the high number of work accidents, the company suffered material losses because it had to provide care for victims until they recovered. Based on work accident data, it is known that there were work accidents of the moderate and severe category where some workers were rushed to the hospital because while working one of the workers was moving truck wheels, but because the worker did not use PPE shoes, the wheels fell on the foot of the worker so that the worker caused an injury in the form of a crack in the worker's right foot which caused the worker not to come to work for 6 days which this affects the production process where CV.Wira Vulcanized has a limited number of workers and already has its own jobdesk.

Based on the problems that occur in CV.Wira Vulcanized, research will be carried out using the Systematic Cause Analysis Technique (SCAT) method. Systematic Cause Analysis Technique (SCAT) is one of the methods to identify the cause of a work accident from the actual picture of the accident, so that it can be known a picture of the direct cause and root cause of the accident event, correction of the failure of company management. Thus the recommendations of this study will be able to propose improvements or corrections completely and permanently.

1.1 Objectives

The purpose of this study is to determine the magnitude of the frequency of work accidents and the severity of work accidents., knowing the factors causing work accidents and corrective actions against problems encountered on CV. Wira Vulcanized using the Systematic Cause Analysis Technique (SCAT) method and provided corrective actions against the problems faced in the CV. Wira Vulcanized.

2. Literature Review

Occupational Health and Safety, or OHS, cannot be separated from employment in a company. The role of OHS in the company must be very necessary to optimize the guarantee of safety and welfare of its employees. However, far from it OHS has a positive impact on the sustainability of work productivity (Ervindo et al, 2020). Mangkunegara (2012) said that Occupational Health and Safety (OHS) is a thought and effort to ensure the integrity and perfection of both physical and spiritual labor in particular and humans in general, the result of work and culture to become a just and prosperous society (Wangi et al, 2020).

According to Heinrich, 88% of accidents are caused by unsafe acts of man (unsafe acts), while the rest are caused by things unrelated to human error, namely 10% are caused by unsafe conditions and 2% are caused by God's destiny. Heinrich emphasized that mistakes or mistakes made by humans mostly cause accidents. According to him, unsafe actions and conditions will occur if humans make a mistake. This is further due to the characteristics of the man, which are influenced by heredity (ancestry) and his environment (environment). If there is a human error, unsafe actions and conditions will be created and accidents and losses will arise (OHS FT UNY Team, 2014).

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According to Waruwu and Yuamita (2016), efforts to prevent work accidents must be carried out as early as possible. The steps that can be taken are the identification of each type of work that is at risk, and group it according to the level of risk, conduct training for construction workers according to their expertise, supervise the implementation of work more intensively, provide Personal Protective Equipment during the project and carry out the arrangement of occupational safety regulations at the construction project site.

Occupational health and safety are closely related to Personal Protective Equipment (PPE), because using PPE can reduce the effects of accidents that occur. PPE which is very important and commonly found in the work area is the helmet, protecting the head from possible falling objects. Earplugs/ ear protectors, as a hearing protective device to work in the sound area due to burrs and knocks. Gloves protect workers' fingers and hands from scratches, impacts and the influence of welding rays. Apron, a long shirt made of lead rubber with radiation absorption, Safety belt, useful for protecting yourself from possible falls Safety shoes are useful for protecting the feet. Glasses protect eye parts from splashes of chemical substances, dust, and powders.

The method used in this study is the Systematic Cause Analysis Technique (SCAT) which is a tool for evaluating and investigating incidents using a SCAT chart. The reason for using the SCAT method is that it can see a picture of the accident that occurred so that the picture of the direct cause and cause of the accident is corrected by the failure of the company's management., can be seen. Therefore, the recommendations of this study will be able to provide suggestions for improvement or correction. TheSCAT technique is a method of analysis based on five error-causing steps that can lead researchers to conclusions through a series of questions. This yes or no question is designed so that researchers can be directed to the next question (Erdhianto, 2017)

3. Methods

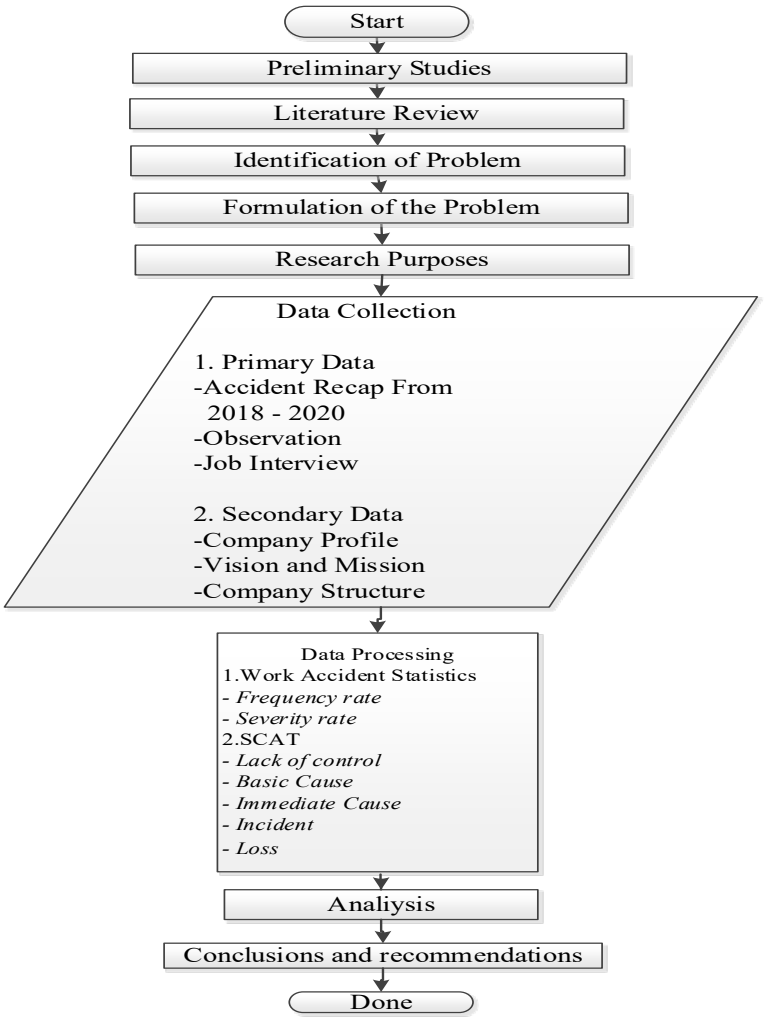


Figure 1. Methods

This research started from a preliminary study, (Figure 1) which contained an introduction. Then, a literature study containing theories will help in data processing. Furthermore, identify problems with the company under study by making observations. After that, determine the goals based on the existing problems. The next stage is data collection, where the data obtained are primary data obtained directly from the company and secondary data not obtained directly such as from journals and books. After that, carry out data processing using the SCAT method. After that, analyze the data processing and finally conclude the research.

4. Data Collection

Target production per month on CV.Wira Vulcanizing has 300 tires, so the annual production target is 3600. The following is production data from CV.Wira Vulcanisir in 2018 to 2020: (Table 1)

Table 1 Production Data of CV.Wira Vulcanized

Year	Number of Productions (pieces)	Target (pieces)	Target Achievement (pieces)
2018	3632	3600	+32 Tires
2019	3531	3600	-69 Tires
2020	3492	3600	-108 Tires

The production costs of CV.Wira Vulcanized in 2018 to 2020 are as follows (Table 2)

Table 2. Production Price of CV.Wira Vulcanized

Year	Tire/Unit Price (IDR)	Tire / Unit Production Price (IDR)	Company Advantages (IDR)	Company Profit Targets (IDR)	Information
2018	1.700.000	1.500.000	726.400.000	720.000.000	Achieved
2019	1.700.000	1.500.000	706.200.000	720.000.000	Not Achieved
2020	1.700.000	1.500.000	698.000.000	720.000.000	Not achieved

CV.Wira Vulcanized from 2018 to 2020 obtained data that there have been 22 work accidents with 168 hours of work that have been lost. (Table 3) Work accidents contained in CV.Wira Vulcanized are caused by several types of accidents and the consequences caused by these types of work accidents:

Table 3. Types of Work Accidents and their Consequences

No.	Types of Accidents	Aftermath (Injury)	Number of Accidents			Total
			2018	2019	2020	
1.	Eye Irritation	Sore, Red Eyes, and Myopic	1	1	2	4
2.	Injured or injured due to Work Tools	Torn Wounds, Incisions, and Bumps	2	2	3	7
3.	Injuries or Injuries Due to Production Floors	Bumps, Bruises, Scratches, Sprains, and Sprains	1	2	1	4
4.	Inhaled Chemicals	Respiratory Disorders	-	1	1	2
5.	Crushed by Tire Wheels	Bone Fractures	-	-	1	1
6.	Pinched Finger during Machine Operation	Bruises, Bone damage Finger	1	2	1	4
Total Accident 2018 to 2020						22

Accident categories are based on the severity of work accidents on the production floor then work accidents can be divided into three categories, namely (Table 4)

Table 4. Categories of Occupational Accidents on CV. Wira Vulcanized

No.	Categories of Work Accidents	Number of Work Accidents
1	Low	10
2	Medium	12
3	High	-
Total		**22**

The category of work accidents and the number of work accidents in CV.Wira Vulcanized have occurred 22 times work accidents and can be known as the category of work accidents based on the following levels:
1. Minor Accident: In the form of minor injuries or minor pain (not losing the working day).
2. Moderate Accident: In the form of injuries needing medical treatment (30-60 days lost working days).
3. Serious Accident: In the form of serious injuries to body parts (30-60 days lost working days).

The injury that occurred within three years has eliminated employees' working days and working hours (Table 5) from CV.Wira Vulcanized are as follows:

Table of 5 Working Days and Lost Working Hours

Year	Accident Categories	Sum	Lost Working Days	Lost Working Hours
2018	Low	2	-	-
	Medium	3	4 days	32 hours
	High	-	-	-
Total		**5**	**4 days**	**32 hours**
2019	Low	4	-	
	Medium	4	7 days	56 hours
	High	-	-	-
Total		**8**	**7 days**	**56 hours**
2020	Low	4	-	-
	Medium	5	10 days	80 hours
	High	-	-	-
Total		**9**	**10 days**	**80 hours**
Grand Total		**22**	**21 days**	**168 hours**

5. Results and Discussion

5.1 Numerical Results

Occupational Accident Statistics

The work accident statistics in this study are to calculate the *Frequency Rate* and *Severity Rate* values to see the ratio of accidents and the severity of work accidents. The calculation is as follows:

1. Frequency Rate in 2018-2020

Known:

Working Hours of 1 person per day = 8 hours
Number of working days per month = 22 Days
Number of working days 2018-2020 = 60 Months x 22 Days
= 1320 Days
Number of employees in 2018-2020 = 16 People
Number of accidents in 2018-2020 = 22 People
Number of days lost in 2018-2020 = 21 Days
Number of hours lost in 2018-2020 = 168 Hours
Number of hours people worked in 2018-2020 = Number of employees known 2018-2020 x working days year 2018-2020 x Working hours
= 16 x 1320 x 8
= 168,960 hours
Number of hours people work (real) = 168,960 Hours – 168 Hours
= 168,792 hours

$$\textit{Frequency Rate} = \frac{\text{Total Accident x 1,000,000}}{\text{Total working people hours}}$$
$$= \frac{22 \text{ x } 1{,}000{,}000}{168{,}792}$$
$$= \frac{22{,}000{,}000}{168{,}792}$$
$$= 130.33 \approx 131 \text{ people}$$

So the ratio of the frequency of work accidents in 2018 - 2020 shows that in every one million human working hours there are 131 people experiencing work accidents.

2. Severity Rate

Diketahui :

Number of hours worked by people (real) 2018-2020 = 168,792 Hours

Number of days lost 2018-2020 = 21 Days

$$Severity\ Rate = \frac{\text{number of day lost x 1,000,000}}{\text{Total working people hours}}$$

$$= \frac{21 \text{ x } 1{,}000{,}000}{168{,}792}$$

$$= \frac{21{,}000{,}000}{168{,}792}$$

$$= 124.41 \approx 125 \text{ days}$$

So, the severity ratio figure obtained is 125, meaning that within the company within a million hours of productive time for 125 days is lost.

5.2 Graphical Results

SCAT is used to investigate and evaluate incidents by identifying immediate causes, basic causes, and tracing weak management controls (lack of control) using SCAT charts. Analysis of potential reproach of work using the SCAT method, using five blocks in the SCAT method:

1. the first thing to do is to write an incident description on the topmost block of the chart.
2. In the second block, an assessment is carried out based on the potential loss of the incident.
3. The third block contains the immediate cause. Direct causes are divided into two categories, namely Hazard Conditions (equipment/environment) and Hazard Behavior (employees)
4. The block contains the underlying causes. The basic causes of accidents are caused by two factors, namely Human Factors and work
5. The fifth block contains actions that can be taken to make the loss control program a result of work accidents a success.

With the explanation of the SCAT chart above for the guidelines for filling in SCAT on CV.Wira Vulcanized as follows (Figures 2, 3, 4, 5, 6 & 7)

Types of Accidents	Event Triggers	Direct Causes	Basic Causes	Remedial Actions
Eye Irritation	Tire Debris during the process of smoothing the surface of the tire that enters the eye area	1. Dangerous conditions Of Knives hitting workers' hands 2. Behavior of danger Not wearing PPE in the form of safety glasses	1. Personal Factors Lack of focus (haste), carelessness of workers 2. Employment factors No oversight from the leadership and lack of compliance with work standards	Increasing worker awareness of the importance of occupational safety and the use of PPE through socialization and appeals as well as regular job training

Figure 2. SCAT Eye Irritation

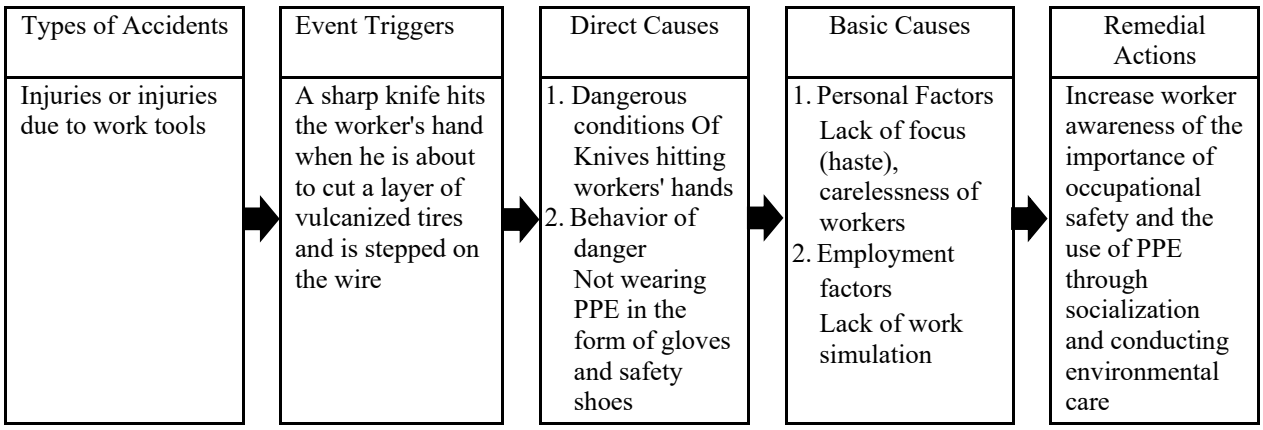


Figure 3. SCAT Injuries or Injuries Due to Work Tools

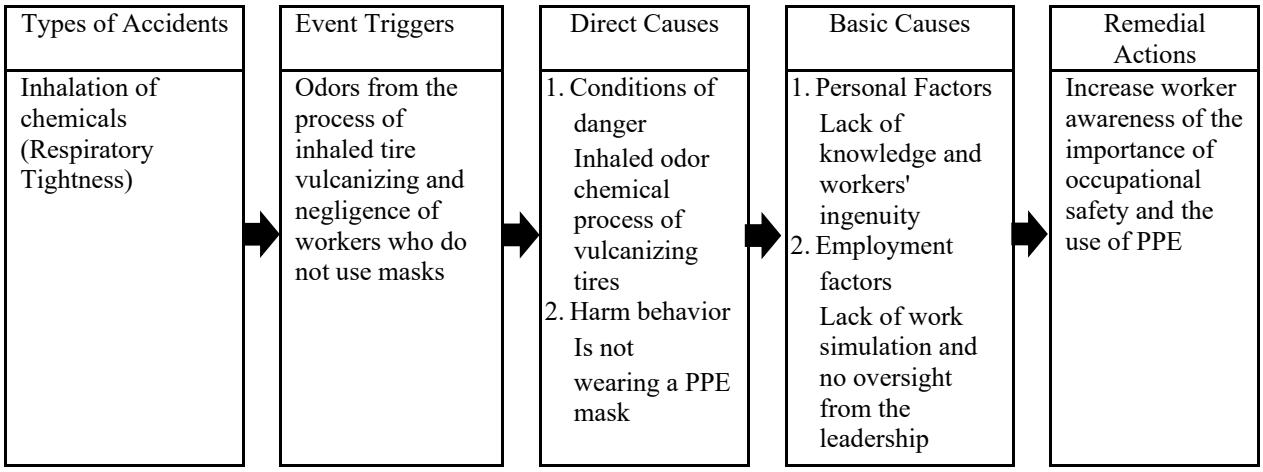
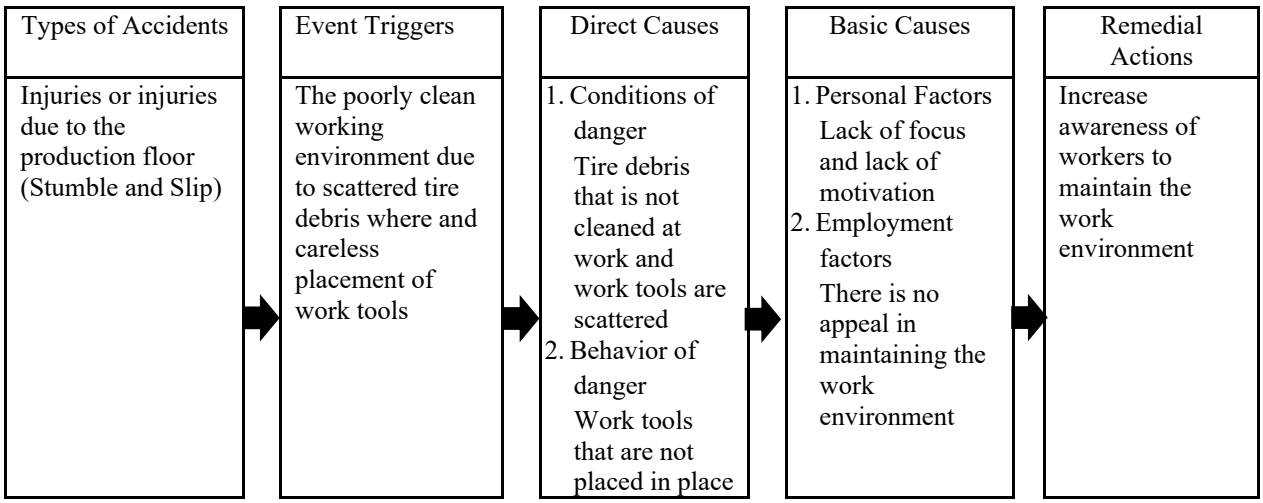


Figure 4. SCAT Inhalation of Chemicals



		and do not maintain the cleanliness of the environment		

Figure 5. SCAT Injuries or Injuries Due to the Production Floor (Stumble and Slip)

Types of Accidents	Event Triggers	Direct Causes	Basic Causes	Remedial Actions
Crushed by Tire Wheels	When lifting the tire wheels, the tire wheels fall and hit the worker's foot and the worker does not wear safety shoes	1. Conditions of danger Tire wheels fall on workers 2. Behavior of danger Not wearing PPE in the form of safety shoes	1. Personal Factors Lack of focus due to fatigue as well as carelessness of workers. 2. Employment factors There is no oversight from the leadership and lack of compliance with work standards.	Increasing worker awareness of the importance of occupational safety and the use of PPE through socialization and appeals as well as regular job training

Figure 6. SCAT Crushed by Tire Wheels

Types of Accidents	Event Triggers	Direct Causes	Basic Causes	Remedial Actions
Pinched fingers during engine operation	Machines that move during the operation of machines that hit workers and workers do not use gloves while the machine is in operation	1. Conditions of danger Dangerous machines 2. Behavior of danger The absence of hand protection in workers.	1. Personal Factors carelessness of workers when performing work 2. Factors of inadequate supervisory work so that workers do not use PPE	Increase worker awareness of the importance of occupational safety and the use of PPE through regular job training

Figure 7. SCAT Pinched Fingers During Engine Operation

5.3 Proposed Improvements

Some of the remedial measures to ensure work accidents on the production floor are as follows (Table 6):
1. Create Occupational Health and Safety (OHS) SOPs

Table 6 Standard Operational Procedure

	STANDARD OPERATING PROCEDURES HEALTH AND SAFETY (OHS) CV. WIRA VULCANIZED		PRODUCTION FLOORING
Code:	Revision: 0	Date: June 17, 2022	Pages: 1
1	**Purpose** 1. Every worker in the CV.Wira Vulcanized area gets occupational health and safety guarantees both physically, socially and psychologically 2. Every work equipment and equipment is used as well as possible 3. All production products are kept safe 4. There is a guarantee for the maintenance and improvement of the health of CV.Wira Vulcanized workers 5. Increase excitement, work harmony, and work participation 6. Avoid health problems caused by the environment or working conditions 7. Every CV.Wira Vulcanized worker feels safe and secure at work		
2	**Scope** All workers in the CV.Wira Vulcanized		
3	**Procedure:** 1. All workers are required to use personal protective equipment such as 1Guard project helmets, cotton and rubber gloves, *ear plugs*, safety shoes, KY115 safety goggles and respirator masks 3. Before work, make sure the worker's condition is in good physical and spiritual health 4. Always *check* the condition of the working equipment, PPE, special PPE is replaced immediately if it is damaged 5. Always keep the production floor clean		

2. Increasing the Awareness of the Importance of Work Safety. This is done by providing the best understanding of how and how to work correctly, precisely, and safely. Providing awareness to employees that Occupational Health and Safety. Thus, employees will be more careful and prioritize safety when doing their work. If the knowledge and awareness of the importance of Occupational Health and Safety is owned by employees, the possibility of accidents will be reduced.

3. Plan the Procurement of Personal protective equipment (PPE) equipment that is needed. In addition to the production equipment needed and planned procurement, work safety equipment must also be carried out procurement planning. From the results of direct observation and seeing various types of consequences caused by work accidents, the work safety equipment needed on CV.Wira Vulcanized are:
   a. Project helmet
   b. Cotton or rubber gloves
   c. ear plug
   d. safety shoes
   e. Safety glasses
   f. respirator mask

4. Require the Use of Personal protective equipment (PPE).
   Personal protective equipment (PPE) is one way that must be done to prevent accidents. By requiring employees to use personal protective equipment (PPE) to prevent the risk of more severe accidents

5. Supervision of Occupational Health and Safety of Employees. This supervision is aimed at supervising employees who do not follow predetermined instructions. The supervision is to supervise and ensure that employees have used the personal protective equipment (PPE) provided, follow work methods correctly, and provide signs that remind them about the importance of work safety. This must continuously carry out security

and supervision of work implementation and a good environment so that it can be ensured that every employee has become accustomed to working using PPE.

6. Conclusion

Based on the results of research that has been carried out on work accidents on CV.Wira Vulcanized, it can be concluded that:

The *Frequency Rate* (FR) of work accidents for everyone million human working hours from 2018 to 2020, 131 people experienced work accidents. As for the severity of work accidents or *Severity Rate* (SR) as a result of work accidents in 2018 to 2020, namely 125 days lost for one million working hours.

The first causative factors that occur first the direct cause of work accidents are dangerous to work equipment (Sharp Knives), not using PPE, exposure to tire fragments, being hit by heavy loads, slipping and also tripping and the basic causes that can also cause work accidents on the production floor are worker coronation, lack of knowledge, inadequate supervision so that workers still do not use PPE, as well as a work environment that is not well maintained, as well as physical and psychological damage factors of workers. Therefore, corrective actions taken to prevent this accident are increasing worker awareness of the importance of workplace safety and the use of PPE through socialization, conducting OHS training, implementing correct OHS SOPs, strict supervision measures for workers who do not use PPE, and carrying out work environment maintenance Routinely

The proposed improvement of the Occupational Health and Safety (OHS) system to CV.Wira Vulcanized in order to minimize work accidents is to make OHS SOPs, add OHS signs, routinely conduct OHS training, and tighten supervision of the use of PPE

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Biography

M. Rizky is a student in Industrial Engineering Department at Sultan Syarif Kasim State Islamic University, Indonesia. His area of interest is Industrial Engineering.

Muhammad Nur is an Assistant Professor in Sultan Syarif Kasim State Islamic University at Industrial Engineering Department. Her educational Background was undergraduate of Industrial Engineering department, North Sumatera University, and got master's degree from Industrial Engineering Department, Gadjah Mada University, Yogyakarta. Her areas of research interest are Modelling System & Simulation, Supply Chain Management, and Engineering Economics

Muhammad Ihsan Hamdy is an Assistant Professor in Industrial Engineering Department - Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia. He is currently a member of IEOM and has published a number of articles about Supply Chain Management, Operational Research and Metaheuristic.

Anwardi is a student in Industrial Engineering Department at Sultan Syarif Kasim State Islamic University, Indonesia. Her areas of interest are Big Data, Logistic System and Simulation Modelling.

Ismu Kusumanto is an Assistant Professor in Sultan Syarif Kasim State Islamic University at Industrial Engineering Department. Her educational Background was master's degree from Industrial Engineering Department, Sepuluh Nopember Institute of Technology, Surabaya. His areas of research interest is Engineering Economics.

Muhammad Rizki is an Assistant Professor in Sultan Syarif Kasim State Islamic University at Industrial Engineering Department. His master's degree was in Industrial Engineering Department from University of Indonesia and got dual degree as Master Business and Administration from National Taiwan University of Science and Technology in Taiwan. He is currently a member of IEOM as faculty advisor and published several articles in international conference about Simulation Modeling, Healthcare Management, and industrial engineering area

Nazaruddin is an Assistant Professor in Industrial Engineering Department - Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia. He is currently a member of IEOM and has published a number of articles about Supply Chain Management, Operational Research and Metaheuristic.