Safety Riding Analysis Using the PDCA Concept for Plumbing Fitting Industry Employees in Tangerang

Sofian Bastuti[1a◆], Rini Alfatiyah[1b]

Abstract. *Based on Law No. 1 of 1970 every company must prevent accidents (including traffic accidents on the way to and from work), fires & occupational diseases. The problem in this study is the number of traffic accidents by employees of the Plumbing Fitting Company in Tangerang. The purpose of this study is to determine the factors that cause traffic accidents and provide solutions for preventing traffic accidents for company employees. Analysis of the factors causing traffic accidents uses the PDCA concept, where this concept has several stages, namely Plan, Do, Check, and Action. The result of this research is employee traffic accidents decreased from 16 accident cases to 3 accident cases or if calculated on average before repair 1.34 accident cases per month and after repair 0.3 accident cases per month decreased by 77.6%.*

Keywords: *safety riding; traffic accident; PDCA, traffic safety*

I. INTRODUCTION

Traffic accidents are a terrible scourge that occurs in many countries (Atmawati et al., 2021; Nancy, 2017). Especially in developing countries, where transportation matters such as tangled yarn (Aulia et al., 2020; Ningtyias et al., 2021; Prima et al., 2015). The current global death rate is 1.24 million per year. It is estimated, that number will triple to 3.6 million per year by 2030 (Adhanudin et al., 2017; Intan Zainafree, Suharyo Hadisaputro, Agus Suwandono, Bagoes Widjanarko, 2021).

Reporting from The Washington Post, according to the latest data from Global Burden, in developing countries traffic accidents are among the top five leading causes of death in the world. Beyond HIV/AIDS, malaria, tuberculosis and other killer diseases. The victims tend to be poor, young and mostly male (Alias et al., 2020; Irfandi & Shaputri, 2020). Indonesia is on this list considering the number of motorists in Indonesia

who are often caught committing traffic violations. (Navianti et al., n.d.; Ni Nyoman Deni Witari, 2020). Indonesia is the third country in Asia under China and India with a total of 38,279 total deaths due to traffic accidents. Although Indonesia is ranked third in terms of data, judging by the statistical percentage of the population, Indonesia ranks first with a mortality rate of 0.015 percent of the population below China with a percentage of 0.018 percent and India with 0.017 percent (Made Priyantha Wedagama & Wishart, 2019; Zhou et al., 2022).

This research was conducted in a manufacturing company engaged in plumbing fittings in Tangerang. This company has ± 1400, the average employee rides a motorcycle. This vehicle is used by employees for transportation to and from work, where on the way there are occasional traffic accidents that befall employees.

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Based on Law No. 1 of 1970 every company must prevent accidents (including traffic accidents on the way to and from work), fires & occupational diseases (Wahyuningsih & Ramdana, 2021). To do this prevention, efforts need to be made to analyze the factors that cause traffic accidents that occur in plumbing fitting employees in Tangerang. Analysis of the factors causing traffic accidents uses the PDCA concept, where this concept has several stages, namely

[1] Industrial Engineering Department, Faculty of Engineering, Universitas Pamulang, Pamulang, Banten, Indonesia

[a] email: dosen00954@unpam.ac.id
[b] email: dosen00347@unpam.ac.id
◆ corresponding author

Plan, Do, Check, and Action (Hussain et al., 2022). The planning stage is to identify the problem to plan the steps that need to be taken in finding a solution, the Do stage is to make the right plan and prepare the solution, the Check stage is to avoid repeated error processes, the Action stage is to develop improvements that have been made (Gu & Zhou, 2017).

The purpose of this study is to determine the factors that cause traffic accidents and provide solutions for preventing traffic accidents for employees of the Plumbing Fitting company in Tangerang.

II. Research Method

This research was conducted in a plumbing fitting company in Tangerang, the object of the research was an employee of a plumbing fitting company. Data collection is based on direct surveys and interviews with management, HSE, and company operators. Determination of the method is done after analyzing the results of observations and references from the literature following the existing problems. This study uses the concept of Plan, Do, Check and Action (PDCA), the stages in this PDCA are as follows (Bastuti, 2017):

1. Stages of the Plan. The first stage of PDCA is the plan, which is the stage where problem identification is carried out and design the appropriate steps to be taken, to find a solution to a problem. At this stage, identification of the problem is carried out based on traffic accident data for employees of the plumbing fittings company in Tangerang, followed by an analysis of the factors causing the problem using the fishbone diagram method by considering human factors, machine factors, method factors, and environmental factors, then analyzing the dominant causal factors. using the Nominal Group Technique (NGT) method involving management, HSE, and Operators.

2. Stages of do. The do stage in this research is to plan improvements based on the results of

the analysis of the dominant causal factors, before making repairs the researchers conduct field observations first to ensure that these factors have a relationship with traffic accidents experienced by employees. If it is stated that there is a relationship, the next step is to carry out repairs.

3. Check stage. This stage has a crucial function and must be considered carefully to avoid the same mistakes being repeated in the future.

4. Stages of action. At this stage, standardization actions are carried out, namely actions to standardize the best methods or practices that have been carried out.

III. Result and Discussion

Stages of the Plan

1. Identification of Problems

The number of traffic accidents experienced by employees is a problem that will be solved by the author. The traffic accident data for plumbing fitting company employees are shown in Table 1.

Table 1. Number of Traffic Accidents in 2020

No	Period	Number of Traffic Accidents
1	January	4
2	February	0
3	March	3
4	April	2
5	May	0
6	June	1
7	July	0
8	August	1
9	September	3
10	October	0
11	November	1
12	December	1
	Total	16

Based on Table 1, the total number of traffic accidents is 16 cases, which means that the problem that occurs is the number of traffic accidents, thus improvements need to be made to reduce the number of accidents.
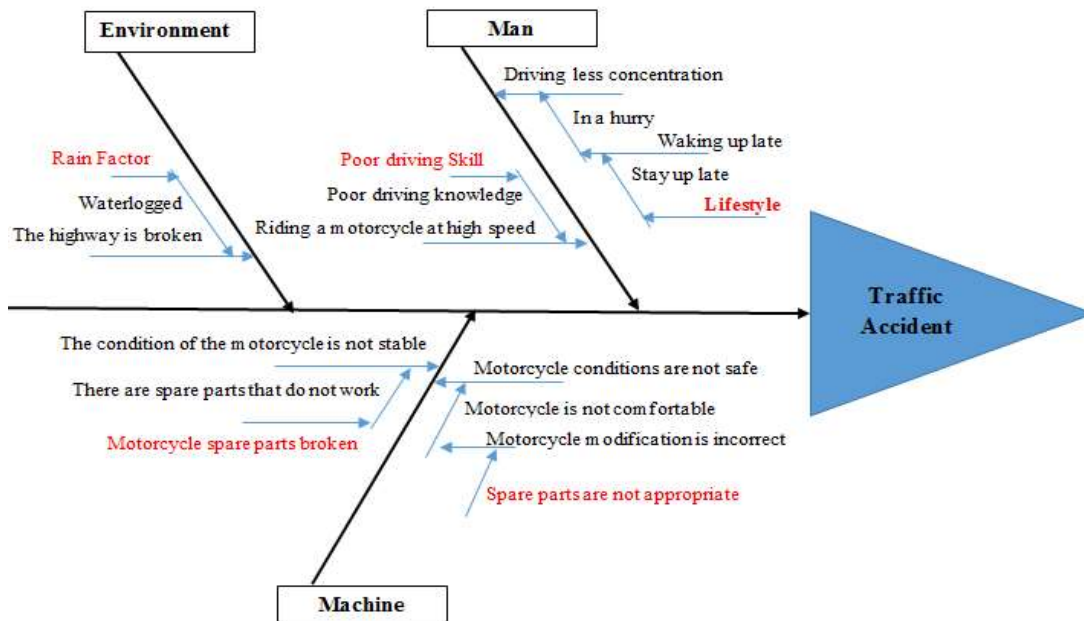
Figure 1. Fishbone Diagram Traffic Accident

Table 2. Nominal Group Technique (NGT) Calculation

NO.	Dominant cause	ASSESSMENT							SCORE
		Worker 1	Worker 2	Worker 3	Worker 4	Worker 5	Worker 6	Worker 7	
1	*Poor driving Skill*	5	2	4	5	3	1	5	28
2	Lifestyle	3	4	3	1	1	2	2	16
3	Spare parts are not appropriate	4	3	5	4	5	5	4	30
4	Motorcycle spare parts broken	2	5	2	3	4	3	3	22
5	Rain Factor	1	1	1	2	2	1	1	9

2. Identification of Causes

Based on the identification of the problem above, the number of traffic accidents that occur among employees is the focus for improvement. The next step is to identify the causative factors of the number of employee traffic accidents using the fishbone diagram method.

Based on the fishbone method as shown in Figure 1, the factors that can cause traffic accidents are:
 a. Poor Driving Skill
 b. Lifestyle
 c. Spare parts are not appropriate
 d. Motorcycle spare parts broken
 e. Rain Factor

3. Determine the Factors that Cause Dominant Problems

After identifying the causal factors, the next step is the identification of the dominant causal factors by the Nominal Group Technique (NGT) method. The Nominal Group Technique (NGT) method is based on voting, Voting is done by employees who know the problem. In this case, the voting is shown to 7 (seven) employees consisting of management, HSE, and operators.

The following is a voting table using the Nominal Group Technique (NGT) for the number of employee traffic accidents as shown in Table 2.

Determination of the dominant root cause can be calculated using the following formula:

$$NGT \geq \frac{1}{2} N + 1$$

where N = number of causes x number of assessment teams

$$NGT \geq \frac{1}{2} 35 + 1 \; ; \; NGT \geq 18.5$$

Based on NGT calculations that the root cause is considered the most dominant cause of traffic accidents among employees of PT. Surya Toto Indonesia, Tbk The Fitting Division has a value greater than or equal to 18.5, namely:

1. Poor driving Skills;
2. Spare parts are not appropriate;
3. Motorcycle spare parts are broken.

Before planning improvements, to further ensure the relationship between the three dominant root causes above to the high traffic accidents of employees, Researchers conduct field observations first.

a. Poor Driving Skill. Judging from the traffic accident data employees found that more crashing than were hit as shown in Table 3.

Tabel 3. Traffic Accident Data And Event Information

No	Section	Event Information	
		Crashing	Run over
1	*Technical*		√
2	*QC. Incoming*		√
3	*PL. Plastik*	√	
4	*Ware House*	√	
5	*Assembling* 5	√	
6	PO 2		√
7	*Assembling* 4	√	
8	QC. PL 1	√	
9	*Injection* 3		√
10	*Assembling* 5	√	
11	*Assembling* 4	√	
12	*Casting* 2	√	
13	*Assembling* 5		√
14	PO 1	√	
15	*Plating* 1	√	
16	MC 2	√	

Based on Table 3 it can be concluded that the driver's skill is still not good, it can be seen from the information of the incident to crash there were 11 cases and in the hit case, there were 5 cases.

b. Spare Parts Are Not Appropriate. The results of checking motor vehicles in the parking area are still found improper vehicle modification as shown in Figure 2.

Figure 2. Spare parts are not appropriate

Figure 3. Motorcycle Spare Parts Broken

Modification of vehicle wheels with small diameter wheel sizes can cause unstable motorists and accidents. Then the rearview mirror is small in diameter so the driver cannot see the vehicle behind him and accidents can occur.

c. Motorcycle Spare Parts Broken. The results of checking motor vehicles in the parking area are still found in the use of damaged vehicle spare parts as shown in Figure 3.

Still found the condition of the rear signal lights damaged can cause motorists to be hit by a rear by another vehicle because the turn signal lights do not work. Then the rearview mirror is damaged so that the driver cannot see the vehicle behind him and an accident can occur.

DO Stages

1. Planning Improvements

To solve this problem in this stage, a corrective action plan is carried out by following the principles 5W+1H (Why, What, Where, When, Who & How). More clearly, the improvement plan is in Table 4

a. Based on 5W + 1H, the following improvement plan is obtained:

Table 4. Planning Improvement with 5W-1H

No	Dominant Cause	WHY	WHAT	WHERE	WHEN	WHO	HOW
1	Poor Driving Skill	So that employees as riders know safety riding	Submission of safety riding socialization to all employees	HRD meeting room and internal meetings section	February 2021 to March 2021	HSE Personnel	Make a safety riding module and socialize safety riding to all employees
2	Spare parts are not appropriate	So that vehicle used by employees according to the manufacturer	Motor Vehicle Inspection	Motorized Vehicle Parking Area	February 2021 to March 2021	HSE Inspection Officer	Checking Nonstandard Motor Vehicles
3	Motorcycle spare parts broken	So that the vehicle is suitable for use	Motor Vehicle Inspection	Motorized Vehicle Parking Area	February 2021 to March 2021	HSE Inspection Officer	Checking Nonstandard Motor Vehicles

b. Make a safety riding module and socialize safety riding to all employees;

c. Checking Nonstandard Motor Vehicles.

2. Make improvements

After the improvement plan is carried out in Table 4, the next step is to improve as follows:

a. Make a safety riding module and socialize safety riding to all employees as in Figure 4 and Figure 5.

b. Checking Nonstandard Motor Vehicles and Spare parts is not appropriate as in Figure 6

Figure 4. Module Safety Riding

Figure 5. Socialization Safety Riding

CHECK Stages (Checking Results After Repair)

After the repair process is complete, the next step is to check the results of the repair. The success indicator of this research is a decrease in employee traffic accidents in the period January 2020 to December 2020 as many as 16 accident cases. Meanwhile, for the period from January 2021 to October 2021, there were 3 accident cases, if calculated on an average 1.34 accident cases per month to 0.3 accident cases per month decreased by 77.6%.

D. ACTION Stages

After checking the results of the improvement the next step is to make the standard of improvement as in Table 5

Figure 6. Checking Nonstandard Motor Vehicles

Table 5. Standardization of Improvements

No	Dominant Cause	Improvement
1	Poor Driver Skill	Make a safety riding module
2	Vehicle Modification is incorrect	Make a standardization of safety riding
3	Damaged Vehicle Spare Parts	Make a standardization of safety riding

IV. CONCLUSION

Based on the calculation of the PDCA concept that the factors that are considered to be the most dominant cause of high traffic accidents are Poor driving Skills, Spare parts are not appropriate, and Motorcycle spare parts are broken. After analyzing the alternative to improving the high rate of employee traffic accidents with the PDCA approach, the results show that Making a safety riding module and socializing safety riding to all employees, Inspecting the motor vehicle modification is not appropriate and the vehicle spare parts are damaged. Based on the repair results, employee traffic accidents decreased from 16 accident cases to 3 accident cases or if calculated on average before repair 1.34 accident cases per month and after repair 0.3 accident cases per month decreased by 77.6%.

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