



Causal Factor Analysis Accident Working with Qualitative Methods & Observation in Manufacturing Company Automotive Cikarang

Catur Gilang N¹, M. Ilham Khoiri², Farel Bramantya³, Critiano Veron Da⁴, Yudi Prastyo⁵

^{1,2,3,4,5} University of Pelita Bangsa

Industrial Engineering Study Program, Faculty of Engineering, Bekasi Regency, West Java (17530)

ABSTRACT: Study This to study factor reason accident working at PT. XYZ during 2019-2022 with cross-sectional method on 100 workers production, using questionnaire, interview, analysis risk, and monitoring technology. The results shows 57% of workers Once experience accident work , especially squeezed engine , with 75% of incidents happened in the section production . Analysis bivariate find connection significant between knowledge safety work and action No safe to accident ($p < 0.05$), making factor man as reason main. Recommendations covers training safety, supervision strict, and utilization monitoring technology for create environment more worksafe in the sector manufacturing automotive.

KEYWORDS: Accident Work , Industry Manufacturing Automotive , Knowledge Safety Work , Analysis Risk , Causal Factors Accident

INTRODUCTION

Industry manufacturing automotive is one of the sector with level risk tall to accident work . According to data from the Central Statistics Agency (BPS), the sector This experience frequency more accidents tall compared to sector others . Accident Work can caused by various factors, including action No safe by workers , conditions environment work that is not adequate , and lack of training and understanding about safety work . Based on data from PT. XYZ, 20 incidents were recorded accident Work in period 2019-2022, with details as following:

Table 1. Occupational Accident Incidents

Year 2019 :	5 Incidents
Year 2020 :	4 Incidents
Year 2021 :	6 Incidents
Year 2022 :	5 Incidents

Of the total , the majority accident happened in the section production (75%), with type the most common accidents is squeezed machine (60%). Research This aiming For identify factors reason accident work and give recommendation For repair .

LITERATURE REVIEW

Literature review This aiming For give runway theoretical support study about factor reason accident work in industry automotive , especially in PT. XYZ. Various study previously show that accident work in the sector manufacturing ,

including automotive , often influenced by various interrelated factors related .

1. Accident Work in Industry Manufacturing

Industry manufacturing, including automotive, known as one of the sector with level risk tall to accident work. According to Nenonen (2011), the sector This own frequency more accidents tall compared to with sector others , where the danger general including squeezed , ground and cut tools . Ubongeh (2022) emphasizes that manual work involving lifting and handling object heavy increase risk injuries, especially in narrow position.

Causal Factors Accident Work

A number of factor reason accident Work has identified in literature. According to Reyes et al. (2015), errors man often becomereason main industrial accident manufacturing. Khanzode et al. (2012) noted that characteristics individual like age, type gender, and experience Work contribute to risk injury. Heinrich (1930) stated that action No safe contributed 88% of all accident work, while condition No safe contribute around 10%.

3. Role of Management and Training

Management factors also play a role role important in safety work. ILO (1998) noted that policy organization, communication safety , and adequate training can reduce risk accident . Ramadhani (2019) found that lack of supervision from management contribute to the height number accident consequence action No safe by workers .

4. Use of Personal Protective Equipment (PPE)

Proper use of PPE is essential For protect worker from risk accident . Ching Wu Cheng and Tsung Chih Wu (2013) showed that awareness worker about dangers and correct use of PPE can reduce incident accident consequence fall or

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squeezed . However , many worker Still No using PPE with Correct or even No use it The same once (Heinrich, 1930).

5. Analysis Risk and Monitoring Technology

Analysis risk is method important in identify potential danger in place Work . Ergur (2020) shows that analysis risk can help in determine steps mitigation For prevent accident work . Use technology like CCTV camera and motion sensor can help monitor activities in risk areas high and detect behavior at risk before happen accident (Davis, 2022).

RESEARCH METHODS

Study This carried out at PT. XYZ in 2023 with design cross-sectional research . Population study consists of of 100 workers in the section production . Taking technique sample used is saturated sampling . Data is collected use questionnaire that includes variables like age , type gender , education , years of service , knowledge about safety , action No safe , condition physical , supervision management , and use of Personal Protective Equipment (PPE). In addition Interview In-depth , Analysis Risk (Risk Assessment), Use Monitoring Technology

Data collection

1. Questionnaire

Data collected through questionnaires distributed to all over respondents . Questionnaire consists of from question closed and open For get more information deep about experience Respondent related accident Work .

2. Interview Deep

Interview done with managers and workers For get outlook more in about experience they related accident work and factors the cause , especially in accidents most frequent work that is case squeezed .

3. Analysis Risk (Risk Assessment)

Done analysis risk For identify potential danger wedged in the work area . This method involving identification danger , evaluation risk , and determination step mitigation .

4. Usage Monitoring Technology

Monitoring technologies such as CCTV camera and motion sensor used For monitor activities in risk areas high . Data from technology This analyzed For identify behavior risk and incident almost accident .

Results and Discussion Research

Data analysis

Data obtained analyzed using the chi-square test to determine connection between variable independent (factor) causes) and variables dependent (accident) Work).

Distribution Respondents

From a total of 100 respondents :

- **Percentage Workers Who Ever Experience Accident Work : 57% (57 workers)**.

- **Types of Accidents Most :**

Table 2. Types of Accidents

Stuck	48%
Cut	26%
Hit	17%
Fallen	10%
Etc	10%

Table 3. Distribution Respondents Based on Experience Accident Work

Work accident	Number (n)	Percentage (%)
Once	57	57
Never	43	43
Total	100	100

Table 4. Types of Accidents Work

Types of Accidents	Number (n)	Percentage (%)
Stuck	20	35
Cut	15	26
Hit	10	17
Fallen	6	10
Etc	6	10
Total	57	100

Analysis Bivariate

Analysis results bivariate show existence connection significant between knowledge safety work and action No safe with incident accident work (p value <0.05). A little explanation of meaning or Meaning from p value <0.05 , namely P value <0.05 in context journal the show that There is significant relationship between variable independent (in matter this , knowledge safety work and action No safe) and variables dependent (event accident Work).

In general more specific , p value is size statistics used For determine whether results obtained from data analysis can considered significant in a way statistics . A higher p-value small from 0.05 shows that possibility results obtained happen in a way as it happens is not enough of 5%. This means that There is sufficient evidence For reject hypothesis zero (which states No There is connection between second variable) and receive hypothesis alternative , which shows that there is connection between knowledge safety work , action No safe , and accident Work .

With Thus , p value <0.05 indicates that improvement knowledge about safety work and reduction action No safe potential reduce incident accident work at PT. XYZ.

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Table 5. Connection Knowledge Safety with Accident Work

Safety Knowledge	Experienced a Work Accident (%)	No Work Accidents (%)
Good	25	75
Not enough	60	40

Causative factor Accident Work

Analysis show that factor human (knowledge and action No safe) has contribution the biggest to the occurrence accident

work. In addition, the conditions physique workers and supervision management also plays a role important

Table 6. Overview of Human Factors at PT. XYZ

Variables	Number (n)	Percentage (%)
Adult Age (19-30 Years)	100	100
Male gender	70	70
High School Education	90	90
Work Period ≤5 Years	80	80

Interview Results Deep

From the interview in-depth work done by a production leader whose child the fruit experience accident Work squeezed namely " *The incident he Work sh i ft 2 parts stamping, hand right pinched press machine . Well there are 2 options possibility That happened , from story he knob the press That there are 2 but The same he 1 the button wedged burden which heavy let his work fast So just press 1 button . But he also said That machine press human error sensor normal cage sometimes no , can So indeed the sensor Already damaged But There aren't any action repair from maintenance* ", found that part big worker feel lack of training about use tool protector self (PPE) and procedures safety contribute to risk squeezed . The leader also emphasized importance more supervision strict in the production process .

- Place storage ethnic group spare. Recommended mitigation steps covering installation barrier physical and improvement training safety .

Usage Results Monitoring Technology

Data from monitoring technology shows that there is improvement behavior No safe moment worker feel in a hurry in finish task them and want fast fast done . Motion sensor also works detect a number of situation at risk tall before happen accident .

Discussion

Research result show that action No safe donate around **88%** as reason accident work at PT. XYZ. This is in line with study previously stated that error man is reason main in accident industry manufacturing . In addition , the lack of training and understanding about the use of PPE is also factor significant in the occurrence accident .

From the results study analysis accident work , cause question that is **How method identify accident Work before matter That occurs** . Identification risk accident before it's very important to happen For prevent injury seriously . Here is steps For identify risk squeezed in the industry automotive :

Do Inventory Danger

1. Activity List At risk

Make a list of all activities carried out in place work , especially involving machine heavy or equipment move .

Narrow Area Identification : Identify narrow areas or difficult passed by Because existence machine or equipment move .

2. Analysis Risk Use HAZARD AND OPERABILITY STUDY (HAZOPS) Methodology

Describe the Work Process

Describe every stages of the work process involved machine heavy or equipment move .

Identification Potential Danger : Identification potential possible danger happen during the work process , including risk squeezed .



Figure 1. Consequences of Work Accidents (Caught in a Press Machine)

Analysis Results Risk

Analysis risk identify some risk areas high in the factory , including :

- Surrounding area press machine .

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Evaluation Consequences : Evaluation consequence from every potential the danger that has identified .

3. Use a Safety Checklist

Standard Checklist : Use the standard checklist the safety that has been set For industry automotive .

Verification Implementation : Verification whether implementation of the checklist Already fully implemented in the field .

4. Conductive Observation Field

Observation Actual : Do observation directly in the field For see practices Work actual .

Note down safety issues : Note down everything issues observed safety , including potential risk squeezed .

5. Survey Worker

Interview Worker : Do it survey through interview with worker For ask for feedback about potential the danger experienced they Alone .

Information Continued : Information advanced from worker can provide more insight deep about risks that have not been detected .

6. Document Review Safety

Procedure Job : Review documents procedure existing work For ensure that all Instructions safety has listed .

Document Update : Update documents the If required For ensure validity information .

7. Implementation of Safety Auditing Program

Periodic Audit : Conduct periodic auditing For ensure that all procedure safety Still implemented with Good .

Recommendation Correction : Give recommendation correction on audit findings that indicate existence gap safety

8. Training and Education Worker

Training : Do it regular training on safety work , including How avoid risk squeezed .

Simulation Emergency : Do simulation emergency For prepare worker in face situation emergency .

With apply identification risk accident Work said , it is expected company can reduce number accident work and create environment more work safe for all over Workers .

Journal This give description deep about factor reason accident work in a company manufacturing automotive as well as steps improvements that can be made applied For increase safety on site Work .

CONCLUSION

Based on results research conducted at PT . XYZ, can concluded that accident work in the sector manufacturing automotive , especially in the production , have significant frequency and majority caused by factors human . Research This find that 57% of workers Once experience accident work , with type the most common accidents is squeezed machine . Analysis show that action No safe and lack of knowledge about safety Work contribute big to the occurrence accident In addition , the conditions physique workers and supervision

management also plays a role important in incident accident .

Recommendations generated from study This covers improvement training safety work , implementation more supervision tight , and use monitoring technology for detect behavior risky . With apply steps recommended mitigation , it is hoped that PT . XYZ can reduce number accident work and create environment more work safe for all over worker

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