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The Impact of Fire Prevention on Fire Fighting Effort Airplane Fueling Station at Iswahjudi Air Force Area Magetan

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Abstract

One of the fire risk factors at the Iswahjudi Airplane Fueling Station is worker negligence in the process of receiving, stockpiling, and distribution (RSD). This is following the results of field observations that show the worker's negligence. The purpose of this study is to determine the Impact of Fire Prevention on the firefighting effort Airplane Fueling Station at Iswahjudi Air Force Area. This study uses quantitative research with a cross-sectional approach, with a population of all workers and outsourced workers, totaling 27 workers. The sampling technique uses the total sampling technique. In this research, the researchers use primary data in the form of fire prevention questionnaires, and restricted area protection, with analysis using the chi-square test. The results showed fire prevention with a p-value of 0,008 ≤ 0,05 so there was an influence between fire prevention and restricted area protection efforts in Iswahjudi Magetan. Fire prevention at the Iswahjudi Airplane Fueling Station is in the good category, while area protection efforts are restricted in the excellence category. The suggestion from the researchers is to realize effective and sustainable restricted area protection efforts such as in security aspects with patrol programs and team coordination.

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Introduction

One of the disasters that are often faced in the industrial sphere is fire. Fires can occur anywhere, such as in settlements to industrial environments. Fires have an impact on all parties such as workers, business owners, government to the community with losses, namely assets, property, job opportunities, human resources to capital (Rahmahniar, 2021).

Various causes of fires such as lightning, hot weather, the causes of humans who are negligent in managing electricity, indiscriminate land burning and event industrial explosions are factors in fire events that exist both in the community and in industry. There are certainly still many causes of the potential dangers around the community, causes that might increase the occurrence of fires are often not applied or not thought of by the community so they can increase the risk of fire.

Fires that are unexpected disaster events so that they have been prepared or are not certain to cause losses. Losses such as loss of life, loss of property, disruption of productivity, disruption of business, and other social losses. The oil and gas industry has a high risk of fire and explosion, most of which are dangerous (ILO, 1991) (Putri and Koesyanto, 2020).

From various industrial fields involved in the world of work, the oil and gas industry (Oil and Gas) is an industry with a high level of potential fire hazard. Industrial processes involving labor, industrial equipment, and fuel oil and gas become a chain of factors for potential fire, where one of the 3 factors experiences interference or system failure is not impossible there can be fires in industry. In addition, the community is also a matter that needs to be considered because it can become a victim of a system failure that causes fires in the oil and gas industry.

Based on data compiled by the Regional Disaster Management Agency (BPBD) East Java Province, there are 24 disaster cases in the daily report data of the East Java Province BPBD as of November 27, 2022, with mild to severe disaster levels (East Java Regional Disaster Management Agency, 2022). From the disaster case data, there are fire disasters that occur in the industry.

According to data compiled in scientific journals written by Tesa L. Syaefudin et al. there were several cases of fires in the oil and gas industry at PT. Pertamina. In 2006 the head office of PT. Pertamina had a fire, in addition, in 2008 a pipe fire at the oil refinery of PT. Pertamina Cilacap, in 2009 and 2023 there were also explosions and fires at PT. Pertamina Fuel Terminal Plumpang, and in 2011 there were 2 cases of fire at the Pertamina UPMS III office and 2 tanks of PT Pertamina Cilacap (Syaefudin, 2018). In addition, at PT. Pertamina Refinery Unit (RU) IV Balongan fire at the state-owned oil company (House of Representatives of the Republic of Indonesia, 2021).

According to the results of initial data observations, where there is a risk of danger that exists at the Iswahjudi Airplane Fueling Station such as the process of receiving, stockpiling, and distributing (RSD) on stockpile tanks, refueller trucks, product pumps, and loading points with the risk of pipeline leaks, collisions, oil spills to the need for a review of the fire prevention system. In addition, with the available fire facilities, namely, evacuation routes, alarm bells, and light fire extinguishers abbreviated as APAB the calculation of needs in fire prevention must be adjusted to the work area and the potential for existing fires.

One of the fire risk factors at the Iswahjudi Airplane Fueling Station is negligence in the process of receiving, stockpiling, and distribution (RSD). Negligence in planning and implementing hazard risk mitigation to the implementation of maintenance and maintenance can also be a factor that increases the potential for fire events. Systemized and well-managed maintenance and maintenance should reduce the risk factor for fire.

Whereas the concept of fire safety, namely control through fire management policies includes organization, documentation, training, housekeeping, maintenance, and emergency planning. In addition, control in the form of fire prevention measures such as fire prevention (reducing fire sources, safety against sabotage, reducing fuel, and limiting the use of flammable materials), fire protection (active fire detection protection, fire warning, smoke control, fire suppression, emergency lights and passive protection of fire protection structures, and evacuation), and fire suppression facilities (access, water supply, information, and damage control) (Lestari, 2021).

One of the oil and gas industries operating is PT. Pertamina (Persero). This State-Owned Enterprise (BUMN) has a business system in exploration to distribute its production. In the implementation of fuel distribution to consumers, of course, there are potential hazards that occur such as accidents to fires. Losses due to an incident are not small, so it is necessary to prevent potential dangers. Fire is the main potential in the oil and gas sector, it cannot be separated from the production produced and distributed which is classified as flammable.

PT. Pertamina has a supply and distribution operation service engaged in aircraft replenishment. Operating unit of Airplane Fueling Station PT. Pertamina functions to distribute Aviation turbine fuel (Avtur) to consumers. Iswahjudi Airplane Fueling Station is located in the area of Iswahjudi Air Force Base, Magetan Regency, East Java. With the target consumers of aircraft operating at the Iswahjudi Air Force Base. The Iswahjudi Airplane Fueling Station has a limited area of 9,225 m^2 and a total area of 19,450 m^2. The limited work location at the Iswahjudi Airplane Fueling Station is an area that is protected from safety and security risks including fire.

Judging from several disasters and emergencies that occur in the industry, of course, management related to fires and disaster emergency response is needed to maintain the safety of workers and the community around the industry. Following occupational health and safety aspects that prioritize the health and safety of all people related to work.

So the recommendations or solutions that have been made by the House of Representatives of the Republic of Indonesia as an aspect of the government in specific working visits related to fire incidents at PT. Pertamina RU IV Balongan is one of them urging PT. Pertamina to take steps to anticipate and improve the Quality Assurance control system so that the incident does not repeat (House of Representatives of the Republic of Indonesia, 2021). In addition, Pertamina has a solution, one of which is to conduct a quick investigation and assessment to immediately determine the causes and impact of the fire, if the incident has occurred (House of Representatives of the Republic of Indonesia, 2021).

As a researcher, you also have a solution if the incident has not occurred is to plan implement, and monitor fire prevention measures to minimize the impact that can be massive by focusing on the ability of the workforce and the readiness of fire facilities. Following the background, researchers want to examine the effect of fire prevention measures on restricted area protection efforts at the Iswahjudi Airplane Fueling Station.

Methods

In this study, the research method used was quantitative. Quantitative can be interpreted as a research method based on the philosophy of positivism, and is used in certain populations or samples, data collection using research instruments, and quantitative/statistical data analysis, to test established hypotheses (Sugiyono, 2019). This research is descriptive observation with a cross-sectional research design, namely research is only carried out once on the object under study with data collection adjusted to the characteristics of the research study subjects.

The definition of population in research is all elements (individuals, subjects) that meet certain criteria taken thoroughly (Adiputra. et al., 2021). The population in this study is all workers and outsourced workers at the Iswahjudi Airplane Fueling Station PT Pertamina Patra Niaga Regional Jatimbalinus, with a total of 27 workers.

The sample is part of the number and characteristics present in the population. The sample in this study is some of the results that have been calculated for all workers and outsourcing workers at the Iswahjudi Airplane Fueling Station in 2023. In this study, researchers used the entire population, which was a total of 27 workers as respondents.

Sampling technique is a sampling technique to determine the sample to be studied in research, there are various sampling techniques used (Sugiyono, 2019). Sampling in this study uses the total sampling technique, which is a technique of taking samples with the number of samples equal to the number of population. Researchers use the total sample because the population becomes a sample in the study (Sugiyono, 2019).

Univariate analysis in this study is to identify fire protection at the Iswahjudi Airplane Fueling Station and identify restricted area protection efforts at the Iswahjudi Airplane Fueling Station. While bivariate analysis in this study was used to understand the significant relationship between variables where there was or was no influence between 2 variables, this study used the Chi-Square Test. The analysis in this study is to analyze the effect of fire protection on the protection of limited areas efforts at the Iswahjudi Airplane Fueling Station.

Results

The following is a table of respondents characteristics by gender, age, length of work and education level:

Table 1. Characteristics of Respondents

Characteristics	f	%
Gender		
- Female	25	92,6
- Male	2	7,40
Age		
- 17 – 25 years	4	14,8
- 26 – 35 years	9	33,3
- 36 – 45 years	7	25,9
- 46 – 55 years	7	25,9
Length of Service		
- < 5 years	9	33,3
- > 5 years	18	66,7
Education Level		
- Primary School	1	6
- Junior High School	1	16
- High School	18	60
- Diploma 3	1	18
- Bachelor	6	0
Totally	27	100,0

[1]Primary data, 2023

Based on the gender of respondents, it shows that from 27 respondents there are 25 male gender with a percentage of 92,6% and female gender as many as 2 people with a percentage of 7,4%. Based on age, it can be seen that from 27 respondents there were 4 respondents (14,8%) aged 17-25 years, 9 respondents (33,3%) aged 26-35 years, 7 respondents (25,9%) aged 36-45 years, and 7 respondents (25,9%) aged 46-55 years. Determination of age range based on the age classification of the Ministry of Health. Based on the length of service, it can be seen that there are 9 respondents (33,3%) with a working period of <5 years (33,3%), and 18 people with a working period of >5 years (66,7%). Based on the level of education, it can be seen that from 27 respondents at the elementary education level with a percentage of 3,7%, 1 respondent at the junior high school education level with a percentage of 3,7%, 18 respondents at the high school/ vocational education level with a percentage of 66,7%, 1 respondent at the Diploma 3 education level with a percentage of 3,7%, and 6 respondents at the Bachelor education level with a percentage of 22,2%.

Table 2. Fire Prevention Frequency Distribution Results

Fire Protection	f	%
Fire Protection		
Good	19	70,4
Less	8	29,6
Restricted Area Protection		
Excellence	15	55,6
Tolerable	12	44,4
Total	27	100,0

[2]Primary data, 2023

Based on the table above, shows that respondents at the Iswahjudi Airplane Fueling Station have good fire prevention with a percentage of 70,4% and less fire prevention with a percentage of 29,6%. Respondents at the Iswahjudi Airplane Fueling Station have restricted area protection efforts of excellence with a percentage of 55,6% and tolerable restricted area protection efforts with a percentage of 44,4%. While in the respondents answer there is no not acceptable result, so the not acceptable category is not found in the results table above.

Table 3. Frequency Distribution Results of Restricted Area Protection Efforts

Variable	Fire Protection				f		p-value
	Excellence		Tolerable				
	n	%	n	%	n	%	
Fire Protection							
Good	14	73,7	5	26,3	19	70,4	
Less	1	12,5	7	87,5	8	29,6	0,008
Total	15	55,6	12	44,5	27	100,0	
RP = 19.600			95% CI = (1.905-201.621)				

[3]Primary data, 2023

Based on the table above, shows that fire prevention affects limited areas of protection efforts. It is known from 27 respondents who have good fire prevention with limited area protection excellence as many as 14 people with a percentage of 73,7% and fire prevention less with limited area protection efforts excellence as much as 1 person with a percentage of 12,5%. Fire prevention is good with efforts to protect tolerable limited areas of as many as 5 people with a percentage of 26,3%, while fire prevention is less with efforts to protect tolerable limited areas of as many as 7 people with a percentage of 87,5%. In fire prevention after going through chi-square analysis get p-value results of 0,008 ≤ 0,05. The p-value is obtained at 0,008 with Fisher's exact test analysis because it follows the chi-square requirements that require a table with an expected count of >5 and exceeding 20%.

Of the various possible impacts or effects that can occur on fire prevention measures against restricted area protection, test results are needed regarding the level of significance of the relationship between variables with the Prevalence Ratio (RP). So it produces RP = 19.600 > 1 so that the variable is a risk factor with a confidence interval (Confident Interval / CI) showing 95% CI = (1.905-201.621) so that the data can be trusted.

Discussion

Fire Prevention at the Iswahjudi Airplane Fueling Station

Based on research that has been carried out on workers at the Iswahjudi Airplane Fueling Station related to fire prevention using 4 parameters, namely reducing the source of flames, safety against sabotage, reducing fuel, and limiting the use of flammable materials used in 14 questionnaire statements. Of the 27 respondents who were workers, 19 respondents (70,4%) had a perception of fire prevention with a good category (70,4%) and less than 8 respondents (29,6%).

Fire prevention is an effort to reduce or even eliminate the possibility of fire (Irmania, 2020). Of the various causes of fire, fire prevention can prevent or reduce the potential for fire. Heat work control is also a fire prevention needed so that there is no contact between the source of the fire and the potential leakage of fluid and/or flammable gases from around the hot workplace (a fire triangle is formed) (Lestari, 2021).

According to researchers, fire prevention at the Iswahjudi Airplane Fueling Station is in a good category with a score of 70,4% or 19 respondents with a perception of good fire prevention. The shortcomings contained in fire prevention in the Iswahjudi Airplane Fueling Station are a minority or only in small numbers. This is supported by programs that encourage the creation of fire prevention at the Iswahjudi Airplane Fueling Station. The availability of warning systems, and fire detectors to the implementation of adequate security perimeter with security assistance from the Air Force Military Police.

Based on field observations from researchers, there are fire prevention efforts in the form of implementing a prohibited area to carry tools or objects that can start a fire. In addition, adequate safety procedures have been implemented for researchers to prevent sabotage, and flammable procedures have been implemented and documented on materials contained in restricted areas.

To support the achievement of good fire prevention the Iswahjudi Airplane Fueling Station can meet aspects of fire prevention from 4 parameters in fire prevention, namely the implementation of procedures for not carrying tools that can start fires, always emphasizing security and there are periodic checks are needed, and limit the use of flammable materials such as replacing materials found in a limited area with non-combustible materials. In addition, awareness and improvement of fire prevention programs should always be developed.

Efforts to Protect Restricted Areas at the Iswahjudi Airplane Fueling Station

Based on research that has been carried out on workers at the Iswahjudi Airplane Fueling Station about efforts to protect limited areas. The research was carried out according to 4 parameters, namely safety limits, extinguisher safety, evacuation safety, and general safety. It is known that the results of the study there were as many as 15 respondents (55,6%) workers had excellent results, while 12 respondents (44,4%) had tolerable results. So that makes the opportunity for other factors that can affect efforts to protect restricted areas at the Iswahjudi Airplane Fueling Station.

Restricted area protection efforts include fire prevention, fire detection, provision of systems for fire control or mitigation, provision of systems for fire control or mitigation, and provision of fire suppression guidance (Lestari, 2021). In protecting hazardous and restricted areas following NFPA 101A which states that an alternative approach to worker safety is to use a risk index using safety boundary parameters, blackout safety, evacuation processes, and safety in general (National Fire Protection Association, 2019).

Based on the analysis, restricted area protection efforts at the Iswahjudi Airplane Fueling Station showed excellent results with a score of 55,6% or 15 respondents with restricted area excellence protection results. This is supported by the buffer zone or restricted area safe limit, there is a blackout path until emergency personnel have been formed and routinely trained.

To support the continuity of good restricted area protection at the Iswahjudi Airplane Fueling Station, of course, to increase the level of security in restricted areas to maintain safety limits because the location of the Iswahjudi Airplane Fueling Station is in the area of the TNI AU (Air Force) Base so that many fighter type aircraft pass by at the DPPU area. In addition, coordination with regional fire departments or firefighters available within the scope of the TNI AU Air Base so they can find out the extinguishing path and know the Iswahjudi Airplane Fueling Station floor plan to facilitate the implementation of extinguishing in the event of a fire to ensure the safety of extinguishers. In addition to the fire department, coordination with residents around DPPU Iswahjudi to provide knowledge to residents in the event of a fire so that public safety and safe evacuation can be realized.

The Effect of Fire Prevention on Limited Area Protection at DPPU Iswahjudi Magetan

Based on the results of cross-tabulation analysis, it can be seen from 27 respondents who have good fire prevention with restricted area protection excellence as many as 14 people with a percentage of 73,7%

and fire prevention less with restricted area protection excellence as much as 1 person with a percentage of 12,5%. Fire prevention is good with tolerable restricted area protection of as many as 5 people with a percentage of 26,3%, while fire prevention is less with tolerable restricted area protection of as many as 7 people with a percentage of 87,5%. So that makes the opportunity for other factors that can affect efforts to protect restricted areas at DPPU Iswahjudi Magetan.

This is supported by the results of research conducted at the location of PT. Pertamina Bitung Fuel Oil Terminal with the conclusion that fire prevention is important to use an occupational safety and health management system to carry out fire prevention tailored to the company PT. Pertamina namely, policy, planning, organizing, implementing, evaluating, and controlling as well as overcoming (Syaefudin et al., 2018).

Based on the chi-square test, the results showed a significance value of 0,008 ≤ 0,05 so that H0 was rejected and Ha was accepted so that there was an influence between fire prevention and restricted area protection at the Iswahjudi Airplane Fueling Station. In addition, according to the results of field observations related to fire prevention as an effort to protect restricted areas, there is a need for improvement in periodic maintenance and maintenance of equipment and materials that can trigger fires such as periodic waste reporting/recap, cleaning dry grass that has been cut. So there may be results with fewer categories in fire prevention against tolerable categories in restricted area protection efforts.

Conclusion

Based on the results of the research analysis and discussion in this study, researchers can conclude. Fire prevention at the Iswahjudi Airplane Fueling Station is in a good category with a good percentage of 70,4%. Meanwhile, limited area protection efforts at the Iswahjudi Airplane Fueling Station are in the excellence category, so fire prevention measures can be an effort to protect limited areas at the Iswahjudi Airplane Fueling Station. Based on the results of the chi-square test, there is an influence between fire prevention and restricted area protection efforts at the Iswahjudi Airplane Fueling Station.

For the Iswahjudi Airplane Fueling Station, Magetan: a) Improve occupational safety performance to reduce the impact that can occur with the implementation of an Occupational Safety and Health Management System by applicable regulations. b) The availability of occupational safety and health experts who have certification following applicable regulations to ensure the implementation of the Occupational Safety and Health Management System runs well. c) Realizing effective and sustainable restricted area protection efforts such as in the security aspect with a patrol program within a restricted area to ensure the security and safety limits are met, in addition to coordination with the emergency management team both internally and externally to familiarize and plan emergency scenarios that may occur to synergize the team.

For STIKES Bhakti Husada Mulia Madiun: It can spur researchers to increase enthusiasm in researching and it is hoped that this research can be a reference and benchmark for further research under what is discussed in this study. For further researchers: In this study, there are still many things that can be developed in the future so further researchers can look for possible things that can be developed from this study such as different variables and indicators, wider samples, different locations, and more appropriate research methods by those discussed in this study.

Author Contributions

Conceptualization and methodology: ARR, ASM, and RR. Software, formal analysis, writing – original draft preparation and editing. Supervision: ASM and RR. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted by the Declaration of CIOMS Guidelines 2016, and approved by the Health Research Ethics Committee STIKES Bhakti Husada Mulia Madiun (protocol code Number: 025/E-KEPK/STIKES/BHM/VII/2023 and date of approval July 17, 2023).

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References

Ahyar, H. *et al.* (2020). Qualitative & Quantitative Research Metode Book.

Ajeng Tyas Damayanti. (2022). 'The Influence of Occupational Safety and Health training on safe work attitudes in train maintenance', 7(6).

East Java Regional Disaster Management Agency. (2022). 'Daily Report -27 November 2022'.

National Standardization Body (1995) *SNI-03-3988-1995 Fire ExtinguisherTest.*

House of Representative the Republic of Indonesia. (2021). 'Spesific work visit on the refinery fire incident at PT. Pertamina (Persero) Refinery Unit (RU) VI Balongan'

Fauzan Ariswa , Meri Andriani, H. I. (2020). 'Proposed improvement to implemetation of the management system (Case study : PT. Karya Shakila Group)', 7(2), pp. 91–100.

Hardani, *et al.* (2020). Qualitative and Quantitative Research Metode. Yogyakarta: CV Pustaka Ilmu Group.

I Made Sudarma Adiputra *et al.* (2021). Health Research Methodology.

Irmania. (2020). 'Effort to Prevent Fire Hazzard in Hot Work at PT Japfa Comfeed Indonesia Tbk Plant Margomulyo Surabaya', pp. 1–10.

National Fire Protection Association. (2019). 'NFPA 11'.

Nurmaningsih. (2022). 'Analysis of the implementation of occupational safety and health plan in implementing PP 50, 2012 at PT INTI Bandung.

Regulation of the Minister of Manpower of the Republic of Indonesia. (1999). 'Regulation of the Minister of Manpower Number 136', (28).

Regulation of the Government of the Republic of Indonesia. (2012). 'Regulation of the Government of the Republic of Indonesia Number 50'.

Fatma Lestari. (2021). *Fire Safety*.

Putri, D. R. and Koesyanto, H. (2020). 'HIGEIA JOURNAL OF PUBLIC HEALTH', 4(Special 1), pp. 350–365.

Rahmahniar, A. *et al.* (2021). 'PT Puninar Infinite Raya Di Baikpapan Effectiveness Of Implementation Of Emergency Response Procedures at PT Puninar Infinite Raya', 7(2), pp. 484–491.

Rahman, I. *et al.* (2021). 'The Effect of Implementation 5R (Housekeeping) in Behavior Based Safety of the Nurse at Ward of Public Health Faculty Universitas Muslim Indonesia',pp. 289–295.

Satrio, J. and Lestantyo, D. (2021). 'Analysis Occupational Safety and Health Management in Fire Emergency State at Mass Rapid Transit (MRT) Jakarta',

Sudalma. (2021). 'Management Commitment in Preventing Work Accidents BPSDMD Central of Java Province', 1(2).

Yulianto, B. and Tejamaya, M. (2022). 'Fire and Explosion Analysis Fuel Unloading Activity at Fuel Station use Dow's Fire & Explosion Index, ALOHA dan MARPLOT'.