

Analysis of Hazardous and Toxic Waste Management (B3) from the Perspective of Safety, Health, Productivity and Waste Minimization at PT X

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ABSTRACT

The management of Hazardous and Toxic Waste (B3) must be carried out by waste producers. PT X as a producer of B3 waste in its production process uses palm oil raw materials and other auxiliary materials. Producers carry out management in accordance with applicable regulations. Waste management can be seen from the perspective of safety, health, productivity and waste minimization. The purpose of this study is to analyze the management of B3 Waste from the perspective of safety, health, productivity and minimization. Data was obtained from surveys and interviews. Analysis method used in statistics. The results of the study showed that 97% strongly agreed with safety, 93% health, 99% productivity and 96% waste initiation.

INTRODUCTION

The rest of the production in the form of B3 Waste, if disposed of directly into the environment and not managed, has the potential to endanger the environment and the health and safety of humans. The impact of B3 waste pollution (especially on industry) will appear directly or indirectly. Indirect impacts arise, if the waste left over from the production process has a reactive nature to the soil, air and water at a certain time and creates a dangerous condition, it can be said that pollution arises. Meanwhile, the direct process has an impact such as poisoning, causing a decline in human health, the surrounding environment, and will affect the balance of the environment such as soil, water and air ecosystems (Nursabrina et al. 2021). According to the Regulation of the Ministry of Environment and Forestry Number 6 of 2021, B3 Waste Management is an activity consisting of reduction, storage, transportation, collection, processing, utilization, and/or stockpiling.

Government Regulation on B3 Waste Number 22 of 2021 explains that B3 Waste is an element that has the property, high or low concentration of substances and/or quantity, indirectly or directly has an impact on pollution and/or endangers human health, the surrounding environment and the survival of humans and other living organisms. The regulation states that the management activities carried out by producers consist of reducing the amount of B3 waste, the process of storing B3 waste, collecting, transporting waste, internal utilization of the company (processing), and/or stockpiling (Utami and Syafrudin, 2018).

THEORETICAL REVIEW

Health

Health is a desire that all employees expect. Employee health is also an important asset for the company. Employees cannot do their maximum activities if their health is affected. Maintaining health is the responsibility of the company. Proper waste management and handling are indispensable to maintain the health of the surrounding environment (Hasibuan A Azmi, et al, 2023).

Employee health indicators can be reviewed from several including 1). Health of the work environment, 2). Waste disposal system, 3) health facilities for employees to provide clean water, 4). Employee health maintenance consists of health services and health checks. Health is a form of business, preventing, maintaining employee health conditions that can cause disease disorders both physically, socially, and metallicly so that employees can work optimally (Ramadhani, 2021).

Safety

Safety is a condition of safety from all activities in the workplace, namely surviving the risk of aspects that cause fires, fractures, poisoning, sprains, hearing loss. All of this is the impact of work activities if they are not properly managed by company management or workplace owners. Safety is a preventive measure to minimize the occurrence of unwanted events at work. Safety indicators in the workplace are 1). the use of personal protective equipment

(PPE), 2). K3 policy, 3). Occupational Safety Regulations, 4). job training, workload and 5). support and communication (Achmad, A Nefaldri et al, 2021).

8 Corporate Sosial ResponsibilityCSR

CSR is a social responsibility carried out by the company. In the industry, this business world is not uncommon. Companies are required to manage and pay attention to external parties such as local communicators, the environment, non-governmental organizations, the government, and employees who are familiar with the name *stakeholders*. The company in carrying out social programs is integrated with business programs so that everything runs together. The social programs provided are in the form of scholarships, MSMEs, education, health and sanitation facilities. So that the company provides positive value for the community, not only achieved in business profits (Julian, et al, 2024).

According to Kusumadilaga 2022, *Corporate Social Responsibility* is a concept that integrates social, business, and environmental in carrying out company business operations with stakeholders in the surrounding community. So that business operations contribute sustainably. CSR can also be said to be marketing in business. The reputation of the company's business name will be good even though CSR requires costs, so it provides a commensurate profit (Kalsum, 2020).

METHODOLOGY

This research was carried out in the company PT X Kawasan Industri, Bekasi Regency, West Java, as shown in Figure 1.

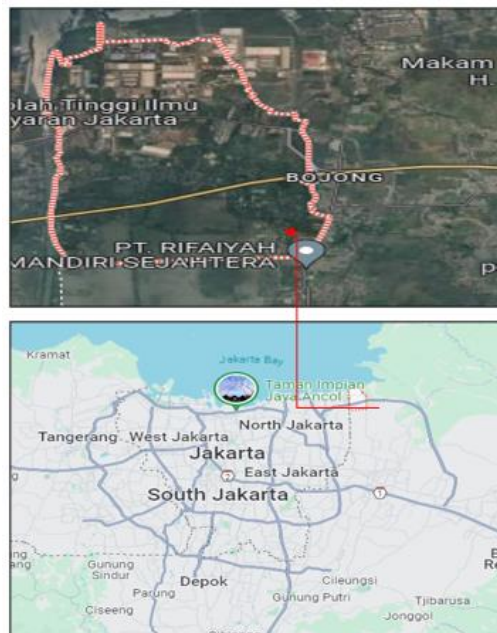


Figure 1 Research Location

The data collection method is a field survey by conducting interviews with employees and local residents. The analysis method uses SPSS statistics.

The data of this research requires primary data and secondary data. Primary data includes data on the results of interviews with employees. Secondary data includes production process data.

Objectives and Scope

The purpose of this study is to analyze the management of Hazardous and Toxic Materials (B3) waste from the perspective of safety, health, productivity and waste minimization. The analysis was carried out by distributing questionnaires to employees on waste producers. The respondents consisted of 28 people.

RESULTS

Influence of variables

The number of respondents at PT X was 28 people, of which 24 were male and 4 were female. This woman works in the laboratory analyst section and WWTP. The following table 4.1 shows the results of the respondents' test based on education, position and gender.

Table 1. Respondent Profile

Position	Sum	Education	Sum	Gender	Sum
Head	2	S1/S2	14	Man	24
Officer	8	SMA	14		4
Operator	18	SMP	0		
		SD	0		

The data source is processed from the results of the questionnaire

Table 1 above shows that 28 employee respondents at PT X gave answers to the questionnaire distributed by the researcher. A total of 2 respondents (8.33%) held the position of Head, 8 respondents (33.33%) as officers/supervisors and 18 respondents (75%) were operator or shift employees. Then information was obtained from the questionnaire that the education of employees was 14 people (50%) S1 and 14 people (50%) were high school or vocational education, there was no junior high school and elementary school education. This means that the company does set the selection for the minimum employee requirement for high school education. Higher education does not have a significant impact on productivity while work experience will have a significant influence on work productivity (Attaqi, L 2022).

Research Instrument Test Results

The variables used in this study are Health, Safety, and Work Productivity which when tested statistically descriptively as shown in Table 2

Table 2. Descriptive Statistical Test Results

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Keselamatan	28	30	40	35.21	.661	3.500
Kesehatan	28	29	40	34.11	.643	3.403
Produktivitas	28	31	40	35.39	.647	3.425
Valid N (listwise)	28					

Source: primary data processed by SPSS, 2024

Table 2 shows that the Health variable has a total minimum score of respondents obtained from the distribution of the questionnaire is 29 and the maximum total score of respondents obtained from the distribution of the questionnaire is 40, with an average total score of 34.11 (the average total score of respondents obtained from the distribution of the Health questionnaire) and a standard deviation of 3,403. The work productivity variable had a total minimum score of 31 respondents obtained from the distribution of the questionnaire and the maximum total score of respondents obtained from the distribution of the questionnaire was 40, with an average total score of 35.39 (the average total score of respondents obtained from the distribution of the work productivity questionnaire) and a standard deviation of 3,425. For the safety variable, the total minimum score of respondents obtained from the distribution of the questionnaire is 30 and the maximum total score of respondents obtained from the distribution of the questionnaire is 40, with an average total score of 35.21 (the average total score of respondents obtained from the distribution of the Health questionnaire) and a standard deviation of 3.50. The conclusion is that safety, health and work productivity felt by employees are good based on the percentage of total values of the variables obtained results above 90%. Companies and employees are indeed committed to maintaining job safety, with 56.7% of respondents strongly agreeing with using compliant PPE.

Results of the Spearman I Correlation Test

The variables used in this study, namely safety, health and work productivity, will be tested statistically by non-parametric spearman correlation. This is based on the number of respondents less than 30 and independent variables. The test results are shown as shown in table 4.4

Table 3. Results of the Spearman Correlation Non-Parametric Test

Correlations					
			Productivity	Health	Safety
Spearman's rho	Productivity	Correlation Coefficient	1.000	.640**	.608**
		Sig. (2-tailed)	.	.000	.001
		N	28	28	28

Health	Correlation Coefficient	.640**	1.000	.782**
	Sig. (2-tailed)	.000	.	.000
	N	28	28	28
	Safety	Correlation Coefficient	.608**	.782**
Sig. (2-tailed)		.001	.000	.
N		28	28	28

** . Correlation is significant at the 0.01 level (2-tailed).

Source: data processed by SPSS, 2024

It shows that the relationship between productivity and health has a H_0 less than alpha ($p < 0.05$) or a value of 0. The formulation obtained was to reject H_0 . In conclusion, H_a who stated that there is a relationship between productivity and health is accepted. This relationship has a strong correlation and is positive because the correlation value is 0.640. Then the relationship between productivity and safety has a H_0 less than alpha ($p < 0.005$) or the value is 0.001. The formulation obtained was to reject H_0 . In conclusion, H_a who stated that there is a relationship between productivity and health is accepted. This means that there is a strong and positive correlation between the two at 0.608. Finally, the relationship between safety and health has an H_0 smaller than alpha ($p < 0.05$) or a value of 0.0. The formulation obtained was rejected by H_0 . In conclusion, H_a who stated that there is a relationship between productivity and health is accepted. This relationship has a strong and positive correlation because the correlation value is 0.782. This shows that the increased employee health indicators lead to an increase in employee productivity. Occupational health insurance for employees or BPJS has a response of 70% strongly agreeing.



Research Instrument Test Results

The results of the descriptive statistical test of the variables used in this study, namely Public Health and CSR, will be tested descriptively as shown in table 4.37. This refers to the opinion of Hanzabee and Sadeghian (2013), that CSR is understood by the public to meet environmental requirements and customer needs, namely public health.

Table 4. Descriptive Statistical Test Results 2

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Deviation
						Statistic
Health	10	20	48	39.20	2.981	9.426
CSR	10	14	44	36.40	3.023	9.559
Valid N (listwise)	10					

Source: Primary data processed by SPSS, 2024

Table 4 shows that the Public Health variable has a total minimum score of 20 respondents obtained from the distribution of questionnaires and the maximum total score of respondents obtained from the distribution of questionnaires is 48, with an average total score of 39.20 (the average total score of respondents obtained from the distribution of questionnaires) and a standard deviation of 9.426. The Community CSR variable had a total minimum score of respondents obtained from the distribution of questionnaires of 14 and the total maximum score of respondents obtained from the distribution of questionnaires was 44, with an average total score of 36.40 (the average total score of respondents obtained from the distribution of questionnaires) and a standard deviation of 9.559. The conclusion is that the health felt by residents around the industry is good (the percentage of the total value of the variable is above 60% calculated from Formula (3.5). For CSR given by PT X to local residents, it is felt good (the total value of these variables is in the range of 60%-80%). PT XYZ's CSR contribution to local residents is based on the results of interviews with local respondents that PT X has provided positive benefits for local residents. Examples of posyandu involvement, health monitoring activities with company doctors, cheap cooking oil bazaar activities.

Test Results of Research Instruments 3

The results of the Descriptive Statistics test of the variables used in this study include minimization and PROPER will be tested descriptively as shown in table 5.

Table 5. Descriptive Statistical Test Results 2

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std.
					Deviation
MINIMISASI	28	29	40	34.71	3.526
PROPER	28	30	40	34.57	3.382

Valid N 28
(listwise)

Source: Primary data processed by SPSS, 2014

Table 5 shows that the Minimization variable has a total minimum score of respondents obtained from the distribution of questionnaires of 29 and the total maximum score of respondents obtained from the distribution of questionnaires is 40, with an average total score of 34.71 (the average total score of respondents obtained from the distribution of questionnaires) and a standard deviation of 3,526. The PROPER variable has a total minimum score of 30 respondents obtained from the questionnaire distribution and the maximum total score of respondents obtained from the questionnaire distribution is 40, with an average total score of 34.57 (the average total score of respondents obtained from the questionnaire distribution) and a standard deviation of 3.382. The conclusion is that the readiness for PROPER felt by the management of PT X is very good (the percentage of the total value of the variable is more than 80% calculated from the formula. PT X's readiness to minimize waste is very good.

Spearman Correlation Test Results

The variables used in this study, namely Minimization and PROPER, will be tested statistically non-parametric spearman correlation. This is based on the number of respondents (N) less than 30 and independent variables. The relationship between waste minimization and PROPER has an H0 smaller than alpha ($p < 0.05$) or the indigo is 0. The formulation obtained was rejected H0. In conclusion, Ha who stated that there was a relationship between Waste Minimization and PROPER was accepted. This means that there is a relationship with a correlation between the two is moderate and positive, which is 0.782. PT X's management understands the benefits of both to the quality of the company's environment, so they see the current conditions as good and need to be improved.

Table 6 Results of Non-Parametric Test of Spearman Correlation 2

		Correlations		
			Minimization	PROPER
Spearman's rho	Minimisasi	Correlation Coefficient	1.000	.782**
		Sig. (2-tailed)	.	.000
		N	28	28
	PROPER	Correlation Coefficient	.782**	1.000
		Sig. (2-tailed)	.000	.
		N	28	28

** . Correlation is significant at the 0.01 level (2-tailed).

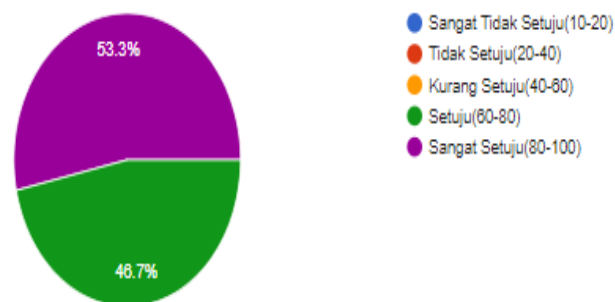
Source: data processed by SPSS, 2024

The following is a hypothesis of the relationship between these variables:

H0 = no relationship between minimization and PROPER

Ha = there is a relationship between minimization and PROPER

Therefore, the role of companies in the implementation of waste minimization and PROPER is important to improve environmental management. So, the attitude of PT X management towards the waste produced is to view the current condition as good, as well as local residents and workers, so that there are efforts to improve to minimize waste. Waste minimization can reduce the waste that workers are exposed to, or in other words healthier. Healthy workers, (not only because of the company's attention, but because of their good working environment), then productivity increases. Waste minimization can also maintain environmental sustainability outside the factory, as the pollution burden is reduced and operational costs are reduced. This can be used by PT X to increase CSR contributions to local residents. If CSR is given well and the environment remains sustainable, then a harmonious relationship will emerge between the two. In the end, the attitude of PT X's management, employees, and local residents is integrated to manage the waste produced by PT X properly. This is in line with Herremans and Allwright (2000) who stated that attitudes, leading to actions and performance (behaviors) related to environmental management issues This is in line with Sudiatmoko Supangkat (2023) who stated that the higher the understanding of the environmental management system and the understanding of the environment, the better the level of employee concern for the environment. All employees responded 53.3% strongly agree that waste minimization provides benefits to the company. But looking at the waste data in the field, there has been no significant decrease. The company is again reviewing the production process that leads to waste minimization. For example, by using clean production technology.



CONCLUSIONS AND RECOMMENDATIONS

For activities with the surrounding community, both in the health and economic sectors, it needs to be improved. Actually, it is the responsibility of the manager of the industrial estate. Because PT X is located in the area that has paid for area management activities. So it is voluntary in terms of the location of business activities.

The safety variable of the majority of respondents answered "yes" by 53.6%. And the most influential question is question no. 4,5,6, this can be seen with the majority of respondents in the question answering "yes" by 60.71%. This shows that employee work attitude indicators affect employee work productivity, where companies and organizational leaders are expected to pay attention to the work attitude of their employees.

The health variable of the majority of respondents answered "yes" by 58.48%. And the most influential question is question no. 3, this can be seen with the majority of respondents in question no. 3 answering "yes" by 75%. This shows that health indicators affect employee work productivity, where companies and organizational leaders are expected to pay attention to the health of their employees to increase employee work productivity.

CSR variables, the majority of respondents answered "yes" by 35%. And the most influential question is question no. 4, this can be seen with the majority of respondents in question no. 4 answering "yes" by 70%. This shows that the indicators of socialization of factory activities, especially community environmental concerns, have an effect on CSR, where companies and organizational leaders are expected to pay attention to sustainable local residents

FURTHER STUDY

Given their shortcomings and weaknesses, it is not surprising that researchers found several problems with writing, grammar, presentation style, and report presentation. To get the best results possible, researchers expect perceptive criticism and advice from many sources.

REFERENCES

- Achmad, A Nefaldri. 2021. Pengaruh Keselamatan dan Kesehatan Kerja Terhadap Produktivitas Kerja Karyawan Bagian Engineering di PT. Industri Kapal Indonesia (IKI) Makassar. *Center of Economic Student Journal* Vol. 4 No. 3, Juli 2021 e-issn: 2621 - 8186
- Arnia dan Warganegara. 2012. Identifikasi Kontaminasi Bakteri coliform pada Daging sapi Segar yang Dijual di Pasar Sekitar Kota Bandar Lampung. *Majority* 26 (4) 101-108. ISSN 2337-3776.
- Bazrafshan, E., F. Kord Mustafapour, M. Farzadkia, K.A. Ownagh, A.H. Mahvi. 2012. Slaughter house Wastewater Treatment by Combined Chemical Coagulation and Electrocoagulation Process. *Plos ONE* 7 (6): e40108. Doi:10.1371/journal.pone.0040108.
- Darmayasa, I.G.B. 2008. Isolasi dan Identifikasi Bakteri Pendegradasi Lipid (lemak) pada Beberapa Tempat Pembuangan Limbah dan Estuari DAM Denpasar. *Jurnal Bumi Lestari*, Vol. 8 No. 2, Agustus 2008. Hal 122-127.
- Effendi, H. 2003. Telaah kualitas air bagi pengelola sumber daya dan lingkungan perairan. Yogyakarta. Kanisius.

- Hasibuan, A Azmi et al. 2023. Tinjauan Penerapan Pengelolaan Limbah B3 Pada Sektor Kesehatan Di Indonesia. *Journal of Law, Administration, and Social Science* Volume 3 No. 2, 2023
- Julian et al. 2024. *The Effect of Corporate Social Responsibility (CSR) And Company Size On Firm Value With Profitability As A Moderating Variable (Empirical Study On Manufacturing Companies In The Consumer Goods Industry Sector Listed On The IDX For The 2019-2021 Period)*. *Management Studies and Entrepreneurship Journal* Vol 5(1) 2024: 871-883
- Kalsum, U. 2020. Corporate Social Responsibility Terhadap Nilai Perusahaan Dengan Profitabilitas Sebagai Variabel Intervening. *AkMen JURNAL ILMIAH*, 17(4), 607-618. <https://doi.org/10.37476/akmen.v17i4.1188>
- Kementerian Pertanian. 2010. Peraturan Menteri Pertanian Republik Indonesia No. 13/permentan/OT.140/I/2010 Tentang Persyaratan Rumah Potong Hewan Ruminansia dan Unit Penanganan daging (meat cutting plant).
- Kementerian Lingkungan Hidup. 2014. Peraturan Menteri Lingkungan Hidup No. 5 Tahun 2014 Tentang Baku Mutu Air Limbah.
- Koby, M., E. Sentruk, C. Aydiner and E. Demirbas. 2006. Treatment of potato chips manufacturing waste water by electroagulation. *Desalination*, 190: 201-211.
- Kundu, P., A. Dabsarkar, S. Mukherjee. 2013. Treatment of Slaughter House Wastewater in a sequencing Batch Reactor, Performance evaluation and Biodegradation Kinetics. Hindawi Publishing Corporation, *BioMed Research International* Article ID134872, II pages.
- Attaqi, Lifya Fillahi. 2022. Analisis Pengaruh Tingkat Pendidikan, Upah, Usia, Pengalaman Kerja Dan Jam Kerja Terhadap Produktivitas Tenaga Kerja Pada Industri Manufaktur. *Journal Of Development Economic and Social Studies*. Volume 1 No 1 Tahun 2022
- Nursabrina, dkk. 2021. Kondisi Pengelolaan Limbah B3 Industri di Indonesia dan Potensi Dampaknya. *Jurnal Riset Kesehatan Poltekkes Depkes Bandung* (13). Hal 80-90
- Utamai. K.T & Syafrudin. 2018. Pengelolaan Limbah Bahan Berbahaya dan Beracun (B3) Studi Kasus Holcim Indonesia tbk Narogong plant. *Jurnal Presipitasi: Media komunikasi dan pengembangan Teknik lingkungan* 15. (2), 127-132
- Maziya, F Binazir dan Azham U Abidin. 2022. Peningkatan Pengetahuan Keselamatan Kesehatan Kerja (K3) dan Pengelolaan Limbah Padat di *Home Industry Manufacture*. *Jurnal Teknik Lingkungan* Volume 28 Nomor 1, April 2022 (Hal 1 - 10) E-ISSN: 27146715

- Nursabrina, dkk. 2021. Kondisi Pengelolaan Limbah B3 Industri di Indonesia dan Potensi Dampaknya. *Jurnal Riset Kesehatan Poltekkes Depkes Bandung* (13). Hal 80-90
- Ramadhani, et al. 2021. Pengaruh Kesehatan Kerja Dan Keselamatan Kerja Terhadap Kinerja Karyawan Pada Hotel Kawana Padang. *Jurnal Matua*, Vol. 3, No. 4, Desember 2021, Hal: 632-643
- Rahman, F. 2020. Dulisme Konteks Proper Sebagai Instrumen Penaatan Sukarela dan Command and Control. *Jurnal Hukum Lingkungan*, 6 (2): 235-256.