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Management of Hazardous and Toxic Waste (B3) in the Biodiesel Industry PT X Tbk

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Abstract
PT X Tbk is a company engaged in the CPO processing industry from palm oil. This company processes from CPO or crude palm oil raw materials which in the process of operation produce hazardous and toxic waste (B3) in the form of liquid waste and solid waste. Regulation of the Minister of Environment and Health No. 6 of 2021 concerning Procedures and Requirements for the Management of Hazardous and Toxic Waste. The management of hazardous and toxic solid waste (B3) carried out by PT X, Tbk includes identification and inventory, packaging, labeling and symbolization, storage, external transportation to third parties and utilization of B3 waste.

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1 Introduction

The village is the smallest unit in the Unitary State Government System of the Republic of Indonesia (Yulianto et al., 2021; Herlina, 2019). Currently, villages are required to achieve self-sufficiency through various village-scale programs and activities based on local wisdom (Putra & Sari, 2020; Widodo, 2018). An independent village is one that can manage access to services, harness its potential and assets, and generate income for the village, enabling development, improved community welfare, and autonomy (Nugraha & Permana, 2021; Wardhana, 2021). The issue of independent and sovereign villages has become central to the government's goals, especially since the enactment of Law Number 6 of 2014 (Kurniawan, 2020). Through the Village Law, it is understood that the concept of an independent village must involve a development framework that empowers villages to self-regulate with their resources (Adisasmita, 2019; Budi & Susanto, 2022). Villages should be seen as social entities with unique social, economic, cultural, and ecological characteristics, reliant on available resources, both physical and non-physical (Aji, 2019; Maulana et al., 2020).

Another key factor is the role of village government and the participation of all community members in various programs and activities within the village (Prasetyo, 2021; Rahman & Kadir, 2020). Innovation and change, especially in today's globalized and digitalized era, are crucial to creating a sustainable, competitive, and self-reliant village (Santoso & Purnomo, 2022; Lestari & Mahardika, 2021). Efforts to realize village independence can be carried out through the Village Community Empowerment program, including access to services and rural economic development, which has long been implemented through programs such as KUBE, fishermen's groups, farmer groups (Gapktan), youth organizations, and cooperatives (Gunawan, 2018; Firmansyah et al., 2020). However, one of the village institutions that plays a crucial role, supported by a clear legal foundation from government regulations, is Village-Owned Enterprises (BUMDes) (Sutrisno & Haryono, 2022). BUMDes, whose capital can come from village participation, are fully managed by the community to utilize village assets and potential for improving the village economy (Sukma, 2021). Therefore, BUMDes are expected to be the driving force of the village economy, managed in a structured, planned, and sustainable program (Putri, 2020).

The existence of BUMDes is absolutely necessary as a strategic step to realize independence (Utomo & Anwar, 2019; Pramono et al., 2018). The aim is to make BUMDes an independent, productive economic institution that can increase the village's original income. For BUMDes to function effectively, the development and management of BUMDes must involve all stakeholders, ensuring optimal resource utilization for community welfare (Wardani, 2019; Santoso & Purnomo, 2022). Pulau Tiga Village, located in Pulau Tiga Barat District, Natuna Regency, Riau Islands Province, holds a strategic location as a gateway for goods and people entering and exiting Pulau Tiga Barat (Sukarto & Hidayat, 2021; Hadi, 2020). Located in a coastal area, the village has potential in marine resources, plantations, livestock, and tourism. Since the enactment of Law Number 6 of 2014 and village funds from the Central Government, the village has been motivated to form BUMDes, such as Pulau Tiga's BUMDes formed in 2016 with businesses like coffee shops (Hendrawan, 2019).

However, due to obstacles, management changes occurred, and a Decree of the Village Head (SK) for BUMDes Management was not issued. In 2018, the Pulau Tiga Village Government formed the BUMDes "Karya Muda Mandiri" on July 8, 2018, based on Pulau Tiga Village Regulation Number 7 of 2018 and supported by a capital loan of Rp 1,000,000 to start a coffee shop (Agustina & Setiawan, 2022). After initial success, the village government provided an additional Rp 75,000,000 in accordance with Village Regulation Number 8 of 2018. Despite this, between 2018 and 2020, the BUMDes failed to impact the economy significantly, causing community dissatisfaction (Rahman et al., 2020). Although BUMDes was reformed in 2018, it was only in 2020 that its presence became widely known in the village. During this time, community complaints grew due to mismanagement of finances, limited transparency, and the failure of initiatives (Prasetyo et al., 2021; Latifah, 2018). Internal audits revealed significant financial mismanagement, losses, and unauthorized loans, despite BUMDes not being designated as a savings and loan entity (Fitri & Syarif, 2020; Harahap, 2019).

In early 2021, the Village Government revitalized BUMDes by recruiting new administrators, directly selecting them in village deliberations, and handing over village assets, such as reservoirs (for clean water), kiosks, and tents, for management by BUMDes (Nugraha & Permana, 2021; Firmansyah et al., 2020). BUMDes expanded to include a trading business unit, kiosk rental, tent rental, and a water unit. Yet, challenges remain, with some residents unaware of BUMDes' purpose and issues in financial and operational efficiency (Wardani, 2019; Santoso & Purnomo, 2022).

2 Materials and Methods

The research was carried out through three stages, namely the stage of preparation, implementation and preparation of reports. Primary data and secondary data are needed in its preparation. The method used to search for primary data is to collect data by means of literature studies, field observations, interviews and documentation. Meanwhile, the method to collect secondary data is to collect existing data in the form of documents from the Company.

3 Results and Discussion

PT X Tbk Marunda unit plant is a private PDPM company engaged in the agri-food industry. As a manufacturer whose production process produces products and leftover products. The rest of the production is mostly in the category of B3 waste such as spent bleaching earh because there is still an oil content of > 3%. If the oil content is below 3%, it is grouped as Non B3 (Attachment XIV PP 22, 2021). This B3 waste is generated from department parts, namely from refineries, utilities, workshops, laboratories, offices

Table 1. Type of B3 Waste PT X Tbk Marunda Unit

No	Name B3 Waste	Waste Code B3	Hazard Categories
1	Spent Bleaching Earth	B413	2
2	Bottom Ash	B409	2
3	Laboratory Liquid Waste	A106d	1
4	Oil sludge	B342-1	2
5	Contamination	B110d	2
6	Used packaging	B104d	2
7	Glyserine pitch	A343-1	1
8	Filtration Residue	A343-2	1

Source: PT X Tbk, 2024

The amount of waste produced and managed has all been recorded and reported on the website of the Ministry of Environment and Forestry, namely SIMPEL. The amount of B3 waste each month varies according to the amount of production. All of them have been well managed by the company. Of the total B3 Waste 8030,633 Tons of Waste produced in the January-June 2024 period, 100% has been managed by licensed third parties.

Table 2. B3 Waste Balance for January-June 2024 Period

Waste Name	Quantity (Tons)
Bottom ash	22.62
Used B3 packaging	1.906
Lab Waste	2.46
Sludge IPAL	912.02
Oil or fat sludge	81.83
Spent bleaching earth	1696.29
Glyserine pitch	5022.70
Filtration residue	213.14
Total	**5652.891**

(B3,2024 Waste Data)

B3 Waste Management

B3 Waste Management of PT X Tbk Marunda Unit is in accordance with Permelhk no. 6 of 2021. The management of B3 Waste carried out is the reduction of B3 Waste, Packaging, Giving symbols and labels, installation, transportation to utilization. B3 waste management includes the collection, transportation, recycling, and management of B3 waste which has an impact on

The environment, by the arena, needs proper management to decide. There are three categories of hazardous waste, namely household B3 waste, medical/infectious B3 waste, and industrial B3 waste (J. Valizadeh et al, 2021)

B3 Waste Reduction

The reduction of B3 Waste has started from the source, namely replacing TL lights with LED lights. Coal burning uses a boiler that burns perfectly so that the FABA produced is small. The process of pressing sludge/liquid sludge to reduce the volume of sludge is carried out by pressing a press filter machine, so as to produce solid sludge and packaging using jumbo bags. A recall program can be conducted to return all unused materials, e.g. e-waste, and many other expired products so as to encourage proper management. (Mmereki et al, 2016)

B3 Waste Packaging

B3 Waste Packaging uses IBC if the laboratory waste is liquid, jumbo bags for filter bags, drums for used oil, and no container packaging. After the waste is packaged in the temple symbol and label according to the characteristics of B3 Waste. This label contains information on name, code, date, source of origin. After that, the waste is stacked with pallets and piles of a maximum of 3 IBCs, the distance between other types of waste is divided.

Figure 1. B3 Waste Packaging

During the packaging process, it is ensured to use complete personal protective equipment. People who handle B3 waste are required to protect themselves from health effects. Exposure to harmful waste causes dermatitis on the skin, asthma with prolonged exposure, eye irritation and shortness of breath (Kanagammani, 2020).

B3 Waste Storage

PT X Tbk for storage in accordance with attachment VII of the Minister of Environment and Forestry Regulation no. 6 of 2021. One pallet filled with 4 drums for liquid waste type. All B3 waste is stored in a Semestara Storage Facility (TPS) that already has integrated into the environmental document for the Technical Details of the B3 Waste TPS. The number of TPS for B3 Spent Bleaching Earth Waste is 4 locations, for Fly ash Bottom Ash (FABA) waste 1 location and for other non-routine waste 1 location. In total, there are 6 locations of B3 Waste TPS.

The technical requirements for the B3 Waste Temporary Storage Site (TPS) must be met, namely there are 28 criteria that must be met according to the PROPER (Public Disclosure Program for Environmental Compliance) candidate or the Company Performance Rating Assessment Program in Environmental Management. The Technical Provisions consist of 1) IKU-General Performance Index, 2) IKS-Sector Performance Index, 3) IKP-Supporting Performance Index, 4) Beyond Performance Index. The general Performance Index consists of temporary storage of buildings, third parties and emergency response systems. The Performance Index consists of company supporters who are committed to environmental policies.

Figure 2. External and Internal Conditions of B3 Waste Disposal Stations

B3 Waste Transportation Activities

The B3 waste produced often requires transportation to the site to an approved treatment, storage, or disposal site. Due to potential threats to public safety and the environment, transportation is given special attention by government agencies to avoid accidental spills (Jeery, 2015). PT X Tbk Marunda Unit carries out transportation from the source of waste to TPS LB3 then handed over to the transporter to the final treatment. Third parties carriers and processors are ensured to have SLO permits approved by the Ministry of Environment and Forestry. According to Rogowsky et al., 2004, globally, the hazardous waste processing / transporter service industry is seen as a profitable source of income for the country. The United States in particular has created the largest market for 34% B3 waste, resulting in more than $45 billion in revenue. This proves that if managed professionally, hazardous waste has the potential to become a source of income for developing countries.

PT X Tbk has established cooperation with transport, namely PT Multi Prima Usahatama, PT Wastec International, PT Multi Hanna Transportindo, PT Prasadha Pamunah Limbah Industri. For processing, cooperation with PT wastec international, PT Indocement, PT Multi Hanna Kreasindo, PT Pasadena Metric Indonesia and PT Prasadha Pamunah Waste industry. Every document transportation must be completed, namely a road letter and a festronic. Festronik is a manifest that has been connected to the documentation of the control of the name and status of B3 Waste that has been transported and integrated into the Ministry of Environment and Forestry. According to Pertiwi et, al. (2017) it is necessary to establish a special program for B3 waste reduction, policies and standard operating procedures (SOPs) as an effort to reduce B3 waste.

PLB3 Proper Value Index

Table 3. PLB3 Proper Value Index

Aspects of Index Assessment	Value (%)
IKU-General Performance Index	70
IKS—Sector Performance Index	
IKP—Pendudung Performance Index	7.08
IKB—Beyond Performance Index	0

The general performance index is 70%, the sector performance index is 0% because it has not met the PM. AG.1 Utilization of WWTP Sludge; PM. AG.2 Third Party;,PM. AG.3 Utilization of Spent Bleaching Earth, PM. AG.4 Utilization of B3 Sludge WWTP as Fuel Substitution in Boilers, PM. AG.5 Utilization of FABA as a raw material substitution. For this clause, PT X company has not implemented the utilization of B3 waste. The supporting performance index of 7.08% has reached the maximum, which consists of a commitment to support the company's environmental management contained in the environmental policy. While the performance index is beyond 0% so that the total value is 77.08%. The Beyond Index is related to technology patents and utilization. The utilization of FABA waste is still very lacking, because since 1999 the FABA waste category is included in Toxic and Hazardous Waste (B3), so in the recycling process there are difficulties in administrative licensing and all sorts of things (Ekaputri and Bari, 2020).

Figure 3. Denied festronics back to user

Identify B3 Waste in storage building warehouses for health exposure risk management, on the other hand in closed waste (M. Wahlstrom et all, 2019).

Table 4. B3 Waste

Waste Name B3	Festronic Count
Bottom ash	1
Used B3 packaging	8
Lab Waste	5
Sludge IPAL	83
Oil or fat sludge	6
Spent bleaching earth	80
Glyserine pitch	278
Filtration residue	36
Fly ash	1
Expired Chemicals	1
Activated carbon	12
Infectious waste	2
B3 contaminated waste	5
Total Festronic	518

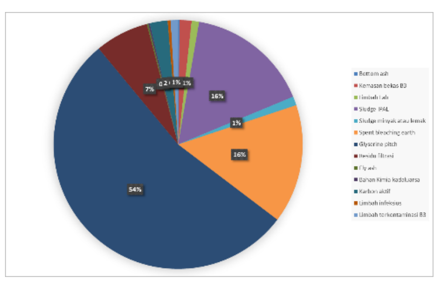

Figure 4. Festronic Count

4 Conclusion

PT X Tbk in the management of B3 Waste is in accordance with regulations. B3 waste management has not utilized B3 waste as a whole, because it is still a catalyst for CO gas reduction. The total transportation in 2024 is 63% spent bleaching earth (B413) waste, 21% Bottom ash, 0.28% WWTP sludge, 11.35% oil sludge, 1.01%, glyserine pitch 62.54%, filtration residue 2.65% Non-routine waste. The total amount of B3 waste that has been managed by a licensed third party in January-June 2024 is 8030,633 tons.

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