



JURNAL IPTEK

MEDIA KOMUNIKASI TEKNOLOGI

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Identification of Toxic and Hazardous Waste in Motorbike Workshop (Case Study: Pranti Village, Menganti Sub-District, Gresik District)

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ARTICLE INFORMATION

Jurnal IPTEK – Volume 25
No.1, May 2021

Page:
43– 50
Published Date:
31 May 2021

DOI:
[10.31284/j.iptek.2021.v25i1.1839](https://doi.org/10.31284/j.iptek.2021.v25i1.1839)

ABSTRACT

Management of toxic and hazardous waste is a system which was designed to avoid the pollution, environmental damage, and the safety of living things caused by motorcycle workshop. Motorcycle workshop is a business type which is engaged in services and customer-oriented in automotive business sector. The aim of this research was to identify the types of waste and calculate the toxic and hazardous waste emission in motorcycle workshop. The research method was conducted by observation and it was analyzed by SWOT method. Based on the research, it was identified that toxic and hazardous waste produced oil used bottle, oil used, and cloth rags. The largest number of wastes was produced by motorcycle workshop was toxic (organic) around 18.200ml in 7 days, flammable waste was 4000ml in 7 days, and solid waste was 34.200 grams in 7 days. The SWOT analysis quadrant on x-axis diagram was 3.42 coordinate point. The position of y-axis diagram was 2.4 coordinate point. To increase public health and prevent of toxic and hazardous waste, it necessary to manage toxic and hazardous waste.

Keywords: Toxic and Hazardous Waste; Motorcycle Workshop; SWOT Analysis; Gresik Regency.

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ABSTRAK

Pengelolaan limbah bahan berbahaya dan beracun (B3) merupakan suatu sistem yang dibuat untuk menghindari terjadinya pencemaran dan kerusakan lingkungan serta keamanan makhluk hidup yang ditimbulkan dari bengkel motor. Bengkel motor merupakan satu jenis usaha yang bergerak dibidang jasa dan berorientasi pada pelanggan dalam menjalankan usaha di bidang otomotif. Penelitian ini bertujuan untuk mengidentifikasi jenis limbah dan menghitung timbulan limbah B3 bengkel kendaraan motor. Metode penelitian dilakukan secara observasi dan menganalisis dengan metode SWOT. Berdasarkan hasil penelitian ini identifikasi limbah B3 yang dihasilkan bengkel berupa botol bekas oli, oli bekas, kain majun. Jumlah limbah terbesar dihasilkan oleh bengkel motor adalah limbah toksik (organik) sebesar 18.200 ml selama 7 hari, limbah yang mudah terbakar sebesar 4000 ml selama 7 hari, limbah padat 34.200 gram selama 7 hari. Kuadran analisis SWOT terletak pada diagram sumbu x terletak pada titik koordinat 3.42, sedangkan posisi pada diagram sumbu y terletak pada titik koordinat 2.4. Untuk meningkatkan kesehatan masyarakat dan mencegah pencemaran limbah B3 perlu diadakan pengelolaan limbah B3.

Kata kunci: Limbah B3; Bengkel Kendaraan; Analisis SWOT; Kabupaten Gresik.

PUBLISHER

LPPM- Institut Teknologi Adhi Tama Surabaya
Alamat:
Jl. Arief Rachman Hakim
No.100,Surabaya 60117,
Telp/Fax: 031-5997244

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INTRODUCTION

Motorcycle demand is increasing and it must be balanced with the additional the motorcycle service centers. In the workshop, the activities produced many wastes of Hazardous and Toxic Materials such as the used of oil, batteries, and rags which have been contaminated by solvents or

lubricants. We could still use the oil used but it would endanger to the environment if it were not managed properly [1]. A business of motorcycle workshop is a business which conducted motorcycle repairing, so that, the motorcycle could be ridden properly or return to the origin according to the owner's wish [1]. A workshop is a small -medium entrepreneurial business engaged in motorcycle or car repairing and service [2].

Government regulation number 22 of 2021 stated that the implementation of environment protection and environmental management [3]; waste management of toxic and hazardous waste materials and non-toxic and hazardous waste Material. The meaning of Hazardous and Toxic Materials is the business result remainder or the activities containing toxic and hazardous waste materials because of the properties or the amount of concentration. It would give impact either directly or indirectly. It could damage the environment, health, the survival of human and other creatures [4]. The materials were so dangerous because the concertation and the amount of toxic and hazardous waste contain were able to endanger human live and environment, regardless of the type of remaining material. Generally, motorcycle workshop produces toxic and hazardous waste in a form of solid waste like spare parts, rags, and batteries. Toxic and hazardous waste which is not managed properly will damage the environment, public health, and human and others living survival. Based on the problem, the writer conducted the research entitled "Toxic and Hazardous Waste Management in Motorcycle Workshop Using SWOT Analysis.

LITERATURE REVIEW

Toxic and Hazardous Waste

Waste is a residual of a business/activity [5]. However, toxic and hazardous waste is a residual of a business/activity which contain toxic and hazardous [5]. Toxic and hazardous materials are substances, energy, and/or other components which have characteristics, concentration, and/or amount either directly or indirectly were able to pollute and/or damage the environment, health, and human and other livings survival [6].

METHOD

Data Collections

The aim of this research was to determine management strategy for toxic and hazardous waste in the motorbike workshop which is located in Pranti Village, Menganti, Gresik. Measurement and directly observation were conducted for 7 days at generation rate and toxic and hazardous waste type. Solid or liquid waste was collected in a closed container with a label and it was stored for a minimum of 7 days. Observation and interview method were conducted using SWOT analysis.

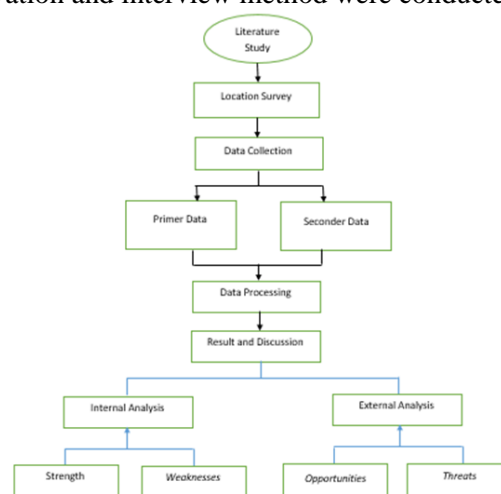


Figure 1. Research Framework



Figure 2. Motorbike Workshop



Figure 3. Workshop Condition



Figure 4. drum for oil used collecting



Figure 5. Oil engine used bottles

RESULT AND DISCUSSION

Management System of Toxic and Hazardous Waste in the Workshop consisted of four stages. They were:

Waste Storage

The storage for toxic and hazardous waste in this workshop has not met with the Decree of the Bapedal Head number 1 of 1995 concerning to the procedure, technical storage requirements, and toxic and hazardous waste collecting. The storage for toxic and hazardous waste placed outside of the workshop did not have special place to keep it but it was only placed outside of the workshop. So, most of the drums for oil used storage which was placed outside of the workshop mixed with rain water [7].

Storage

The storage for toxic and hazardous waste in the workshop was not accordance with the Decree of Bapedal Head number 1 of 1995. The general provision for storage must be strong, durable, it was not leaking, and it was not easy to corroded. Besides, the storage used must be closed to avoid exposure of toxic and hazardous waste to the air [7].

Transport

The transportation was carried out to send all of toxic and hazardous waste produced by the workshop to the manager or users of this waste. The transportation of toxic and hazardous waste must pay attention to the vehicle condition and the storage which were completely safe for the transportation process [7].

Processing

Over the years, oil is recycled for reuse and to protect the environment from oil waste. It was estimated that a gallon of oil used had a potential to contaminate a million gallons of mineral water. In addition, this oil used was disposed to the estuaries, lakes and creeks which could threaten aquatic live in that place. If someone handled the oil used seriously, it could save the use of oil used every day [7]. Recycling of oil used could be carried out by industrial which process lubricant oil used. It

used certain technology to produce basic lubricant. Basic lubricant oil is one of main material which is used raw material process or lubricant manufacturing (blending) in lubricant production. Basic lubricant was mixed with additives according to the formula to produce new lubricant oil.

Oil used must be collected by using special storage tool and it could avoid from other impurities because oil would be recycled. Mixing oil used with other wastes would reduce the quality and increase the cost for refining process. Oil storage must be made from the materials which is resistant to rust and tightly closed, clean and labeled "USED OIL". It must keep out from children, pets, and flames. In a certain period of time, this oil used could be sold to the oil used collectors and next, it would be sent to the oil processing company. It will be better if there are many garbage storages and it provides oil used storage in housing area. The societies are not allowed to use oil used storage for accommodate chemical materials such as bleach or other substances. The storage was special designed to accommodate oil used which would be recycled by the company. It must be convinced that the storage was strong, rust resistance, and it was not leak.

Table 1. Identification result of toxic and hazardous waste

Waste	Emersion	Characteristic
Oil	18.200ml/7days	Flammable
used rags	4000grams/7 days	Toxic
Bottle used	34.200grams/7 days	Flammable

Workshop Waste Hazards

Lubricant oil used is toxic and hazardous waste from unspecified sources and it is category two. The meaning of unspecified is lubricant oil used does not come from main process but it comes from equipment maintenance activities. The meaning of category two for lubricant oil used is oil used waste has a delayed effect and it gives indirect impact for human and environmental and it has sub chronic or chronic toxicity. Lubricant oil used is flammable and toxic.

Motorbike Workshop

Based on the research, it was obtained the volume of toxic and hazardous waste on motorbike workshop. It was described in this table.

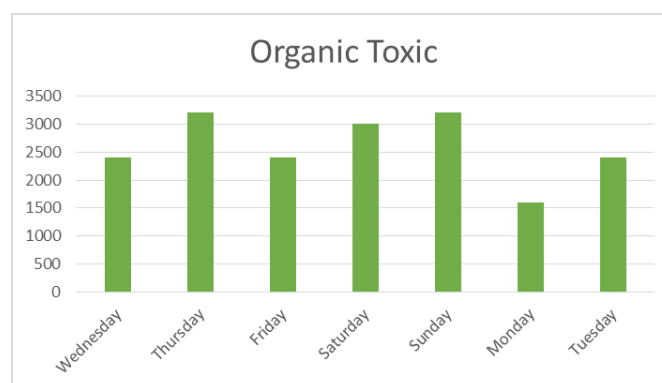


Figure 7. Volume of liquid toxic and hazardous waste

The most volume of liquid toxic and hazardous waste produced was on Thursday and Sunday around 3000 ml. On those days, many people had a day off from work, so they went to motorbike workshop for servicing and changing their engine oil. On Monday, there was only 1600 ml, organic toxic because the most of the societies were working.

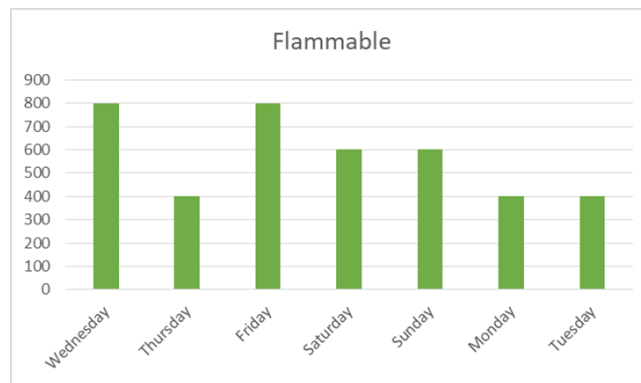


Figure 8. Volume of liquid hazardous waste

The toxic and hazardous waste is flammable. It has not appropriated management to process hazardous waste because workshop owner had lack of knowledge how to manage hazardous waste in his workshop and there was no socialization from the government to face this problem. From the data, it was showed that on Wednesday and Friday were the most volume obtained this motorbike workshop of 800 ml because on those days, many people had gotten their free day and they went to workshop for servicing their motorcycle. On Monday, Tuesday, and Thursday were the lowest volume obtained of 400 ml.

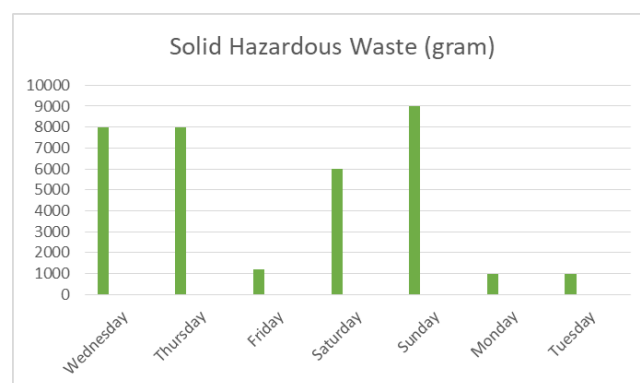


Figure 9. Volume of solid hazardous waste

The minimum amount of toxic and hazardous waste was produced by the workshop was on Monday, Tuesday, and Friday of 1000 ml, because many of the societies were working. The most waste generated was on Sunday of 9000 ml, because Sunday was off day. So, they came to the workshop to repair their motorbike.

Toxic and Hazardous Waste generated by Motorbike Workshop

Motorbike workshop produced solid waste, Solid wastes were from metal and non-metal. Non-metal solid waste could be from oil rags, dry paint, tires used and others. Metal solid wastes consisted of nuts, couplers and welding scraps. There was liquid waste in motorbike workshop, such as oil used, scattered materials, solvents or cleaners, and water. Solvents or cleaners are generally very volatile, so it causes air pollutant. Inhalation of solvents can cause of respiratory problems. liquid fuel is flammable and it's easy carried away by water flow. Petrol fuel is easily vaporized and inhaled. Waste water was heavily contaminated by oil (lubricant oil) and fuel in the workshop business. Contaminated water would flow along the existing waterways and it was so easy to spread the contaminants carried by it. It could give dirty impression and difficult to clean if oil used did not properly managed. In the other side, it would make the floor slipper and it caused work accident.

SWOT MATRIC ANALYSIS

SWOT analysis is a method used to identify support and inhibiting factors for the toxic and hazardous waste management. There were several SWOT quadrans like IFAS and EFAS on motorbike workshop in Pranti Village, Menganti Sub-District, Gresik District.

Table 2. Strategy Identification Result of Internal Factors Analysis Summary (IFAS)

No	Strength	Level	Weight	Rate	Score
1	The ability of motorbike workshop to reduce toxic and hazardous waste	3	0.43	4.00	1.71
2	The ability of motorbike workshop to increase workshop cash	4	0.57	3.00	1.71
3	Motorbike workshop has potential to increase the number of customers	4	0.57	4.00	2.29
Total Strengths (S) Value		11	1.57		5.71
Weaknesses					
1	Low price of oil used	3	0.43	2.00	0.86
2	Expensive price of toxic and hazardous waste management	2	0.29	2.00	0.57
3	The level of customers' activity	2	0.29	3.00	0.86
The sum of Weaknesses (W) value		7	1.00		2.29
Total of Internal Factor			2.57		

The score from description of each strength factor was obtained 5.71 with the weighting total of 1. The score from explanation of each weakness factor obtained 2.29 with the weighting total of 1. The total score from the sum of strength and weaknesses factors were obtained 7.00. The score result in external factor was opportunities and threat for each factor could be seen in table 3.

Table 3. The result of Strategy identification of External Factors Summary Analysis (EFAS)

No	Opportunity	Level	Weight	Rate	Score
1	Workshop's ability to manage toxic and hazardous waste	4	0.8	4	3.2
2	there was a product from oil used which was produced into new oil	3	0.6	2	1.2
Opportunities (O) value		7	1.4		4.4
Threats					
1	This material is flammable liquid	2	0.4	2	0.8
2	engine oil spilled on the ground could damage the environment	3	0.6	2	1.2
Total Threats (T) Value		5	1.00	10	2

The score from description of each opportunity was obtained 4.4 with the weighting total of 1. The score from threat factor explanation obtained 2 from the weighting total of 1. The score from the sum of opportunities and threat factors got 6. After the researchers conducted scoring, they saw the tendency of each factor. Internal factors were strength and weaknesses and external factors were opportunities and treats in the position of quadrant assessment in Figure 2. Observation result was obtaining strategy factors in the form of numbers which was inventoried into Strategic Matrix of Internal Factor Analysis Summary (IFAS) and strategic Matrix of External Factors Analysis Summary (EFAS) could be seen at table 4.

Table 4. The result of Hasil IFAS and EFAS Matrix

No.	Total of Internal Factor Scores	Total of External Factor Scores
1	$S = 5.71$	$O = 4.4$
2	$W = 2.29$	$T = 2$
–	Difference Between score $S - W = x$	Difference between score $O - T = y$
	$X = 3.42$	$Y = 2.4$

Based on the scoring analysis result of external factors obtained X axis = 3.42 and Y axis = 2.4. Then, the analysis result was presented in SWOT quadrant factor based on Pearce san Robinson (1998) which could be seen in Figure 10.

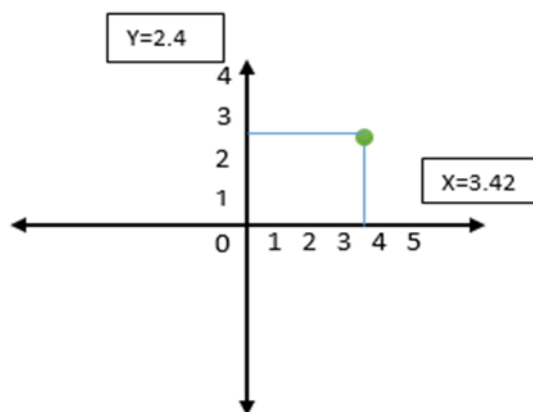


Figure 10. SWOT quadrant factor

The Figure explained that X and Y axis were negative and positive, so, X axis position in the diagram was at 3.42 coordinate point and Y axis position was at 2.4 coordinate point. Based on SWOT analysis result, toxic and hazardous waste management in this workshop was in quadrant 1 (supporting progressive strategy). The management of toxic and hazardous waste was an important strategy. Through this management, environmental pollutant could be minimized and support the increasing of public health.

CONCLUSION

Based on research result, there were several characteristics of toxic and hazardous waste which have been found in motorcycle workshop. There characteristics were flammable waste, toxic used rags, and flammable bottle used. The emergence of toxic and hazardous waste was 18.200 ml in 7 days, flammable waste was 4000 grams in 7 days, and solid waste was 34.200 grams in 7 days.

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