



# Hazardous Waste Management of Establishments Motorcycle Repair Shop in the Phuket Municipality Area Mueang District, Phuket Province

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## Abstract

Hazardous waste management of establishments motorcycle repair shop in Phuket municipality area, Mueang district, Phuket province has the objective to study on types, quantity, and methods in managing hazardous waste from motorcycle repair shop, as well as on problems, obstacles, and suggestions for hazardous waste management. In this study, record forms were used to collect data on type and quantity. Interview, observation, and taking photos were used to record on methods on storing hazardous waste from 10 motorcycle repair shops. Questionnaire was used to study on hazardous waste management, problems, obstacle, and suggestions from 55 motorcycle repair shops. The data was collected from August - October 2018.

The result shows that in 100 percent of hazardous waste consists of the following types: 1) engine oil, 2) tyre, 3) inner tube, 4) grease can, and 5) engine oil can. In terms of quantity of hazardous waste, engine oil, gear oil, and lubricant oil are 443.80 liters in total. The total amount of tyre is 624 pieces and 2,431 pieces for total amount of inner tube. The result of the study on hazardous waste management found shows that used oil buckets are used for storing engine oil, which is a good way to reduce contamination. For used tyre and inner tube are stacked up in the shop without any containers, which need to be improved in order to reduce contamination. Regarding the methods for hazardous waste management, the most used method is waste buying companies, which is accounted for 100 percent including engine oil, metal parts, chains, lubricant oil, and gear oil. Items that are most disposed to municipality's bin are gloves with engine oil stain and used face masks, which accounted for 100 percent. Re-use is accounted for 90.90 percent, which include clothes with engine oil stain. Selling is accounted for 21.82 percent and the items that most sold are lubricant and engine oil cans. Other methods like putting in closed garbage bags and lay by municipality bins accounted for 74.55 percent on waste that contaminated with engine oil. The study on problems and obstacles found that the lack of discipline in managing hazardous waste is the major cause of improper hazardous waste management, which is accounted for 85.47 percent. The study on suggestion for

hazardous waste management found that most of the operators suggest that there should be bins for each type of hazardous wastes specified clearly. This suggestion is accounted for 89.10 percent.

**Keywords :** Motorcycle repair shop; hazardous waste; hazardous waste management

## Introduction

In Thailand nowadays, there is high expansion of economy, which the government imposed development policies and improved infrastructure system in all forms of transportation in order to increase the capacity in traveling and goods shipment for both domestic and international movements to be more convenient, secure, and faster [1]. There are many formats of transportation in the transportation system such as ships are used for water transportation, planes are used for air transportation, and for land transportation different types of cars are used. However, the most used transportation format is land transportation by using cars, which is easy and convenient for public transportation or transport of goods. For this reason, people are more prefer to use cars in traveling more and more. A smaller vehicle like motorcycle becomes another alternative for working people because it is flexible, can travel quickly on the road, low maintenance cost, and its gas price is not too expensive when comparing to public transportation or private car. This makes the number of motorcycles increases rapidly.

The continual use of motorcycle in traveling causes deterioration, which repair or change of vehicle parts like engine oil, tyre, bulbs, battery, and lubricant are needed to be done in motorcycle repair shops. If these hazardous wastes are not manage properly and disposed to environment with community wastes, it will leak out or spread to the

environment and affect people's health. Moreover, it can cause the destruction of ecosystem, antique objects, and landscape [2].

Tourism development in Phuket has been improved rapidly. In the area of Phuket municipality, Mueang district, Phuket province is the heart of the city, which consists of 2 sub-districts: Talad Nue and Talad Yai. These two sub-districts are considered to be the center of many important governmental and private organizations and tourist attractions like schools, municipality office, banks, shopping malls, old town, and hotels. In each day, there are many people including tourists and working people come to use services from these places. For this reason, the number of tourist and latent population in Phuket increase a lot. Hence, the use of motorcycle for traveling increases. This causes those who have knowledge in motorcycle repairing make it a profession by operating motorcycle repair shop. From this, the number of motorcycle repair shops also increases. According the list of registered motorcycle repair shops, there are 25 shops registered [3]. The additional survey was conducted by purposive sampling due to there are many unregistered operators in the area of study. Therefore, the researcher is required to conduct a survey, which found that there are another 34 shops in Phuket municipality area, Mueang district, Phuket province. In total, there are 58 shops spread in all area of Phuket municipality. Motorcycle repair shops are the source of important hazardous waste incurring from repairing or changing parts services after the use of motorcycle. From the

problems mentioned above, it makes the researcher became interested in studying on hazardous waste management of motorcycle repair shops in Phuket municipality area, Mueang district, Phuket province in order to learn on the types and quantity of hazardous wastes, methods in managing hazardous waste in motorcycle repair shops.

## Materials and Methods

This research is conducted as a survey research by using tools and methods in collecting data, and duration of data collecting as follow:

### 1. Tools, sample groups, and duration of research

In this research, outcome record and questionnaire are used as tools in collecting data as follow:

1.1 Data on types and quantity were collected from 10 motorcycle repair shops, which randomly selected from purposive sampling because these 10 shops corporate in hazardous waste management that can be good for the study. Moreover, there are similar services provide in these 10 shops. The data is collected by using outcome record once a week for the duration of 3 months within the area of Phuket municipality, Mueang Phuket district, Phuket province.

1.2 Interview, observation, and taking photos are used in collecting information on storing hazardous waste in 10 motorcycle repair shops, which randomly selected from purposive sampling because these 10 shops corporate in hazardous waste management that can be good for the study.

1.3 For methods in hazardous waste management, problems, obstacles, and suggestions of motorcycle repair shops in Phuket municipality area, Mueang district, Phuket province, the data

was collected by using questionnaire. The questionnaire was divided into 3 parts: Part 1 collects general information of respondents, which includes gender, age, level of education, length of operation time, average number of motorcycles receiving services per day, and type of services provided. Part 2 collects information on methods of hazardous waste management (methods include using municipality services, reuse, storing in container to be disposed later, sell, buying companies, or other methods). Part 3 collects information on problems, obstacles, and suggestions of motorcycle repair shops in managing hazardous wastes.

The study on problems, obstacles, and suggestions of motorcycle repair shops in managing hazardous wastes, purposive sampling was used to collect information from 55 shops. There are 25 shops from the list of registered motorcycle repair shops of municipality office and another unregistered 34 shops from self survey within the studied area. In total, there are 59 shops in Phuket municipality, Mueang district, Phuket province. The duration of data collection started from August to October 2018. Moreover, the data was collected from 55 shops because the other 4 shops were not available willing to corporate in responding to the questionnaire.

2. Equipment used in collecting information include gloves, weighing scale, face mask, garbage bag, sticky tape, pens, and outcome record form.

3. In analyzing data, studying on types and quantity of hazardous wastes in motorcycle repair shops, the results were used to analyzed by using basic statistics include percentage and average value. Then, display the data in table. Moreover, data from the study of methods in hazardous waste management of motorcycle repair shops was used to analyzed in terms of narrative analysis in order to find a conclusion.

## Results and Discussion

1. The result of the study on types of hazardous wastes incurring from motorcycle repair shops

Types of hazardous wastes incurring from motorcycle repair shops include used engine oil, tyre, inner tube, lubricant can, and engine oil can, which accounted for 100 percent due to a motorcycle requires to discharge engine oil every 1,000-4,000 kilometer of riding in order to

maintain the capacity of engine to function well always. This is relevant to the study of Suparat Chanpetch [4] on hazardous waste management of auto service centers in Phuket, which found that the type of hazardous waste that can be found the most is used engine oil.

2. The result of the study on quantity of hazardous wastes incurring from 10 randomly selected motorcycle repair shops is displayed in table 1.

**Table 1** shows the total quantity of hazardous waste incurring in 3 months in 10 randomly selected motorcycle repair shops

Rank	Type of Hazardous Waste	Quantity	Unit
1	Oil - used engine oil - Gear oil - Lubricant oil	443.80	Liter
2	Tyre	624	Piece
3	Inner tube	2,431	Piece
4	Metal remains such as bearing, chain, screw, spark plug, and brake lining	270.30	Kilogram
5	Aluminum can - Rustproof Spray can - Paint can	63.10	Kilogram
6	Plastic can - Grease can - Engine oil can	163.40	Kilogram
7	Electrical wire	6.10	Kilogram
8	Light	629	Bulb
9	Battery	225	Unit

The study of quantity of hazardous waste incurring in 10 randomly selected motorcycle repair shop in the area of Phuket municipality, Mueang Phuket, Phuket province found that the amount of used engine oil, gear oil, and lubricant oil is 443.80 liters in total. The operators of motorcycle repair shops provided information that a motorcycle should discharge and change engine oil once reached 1,000-4,000 kilometers of usage in order to maintain the capacity of engine for the effective functioning [5]. The second highest amount of hazardous waste is tyre, which there are 624 tyre in total. The total amount of inner tube is 2,431 tubes due to the usage of motorcycle caused fast deterioration of tyre and inner tube. In terms of metal remains like bearing, chain, screw, spark plug, and brake





lining, the total amount is 270.30 kilograms. Plastic cans for grease and engine oil in total are 163.40 kilograms, which is higher than the amount of aluminum cans, 63.10 kilograms, of rustproof and paint spray [6]. The total amount of electrical wire is 6.1 kilograms, motorcycle lights is 649 bulbs, and battery is 225 pieces.

3. Results from the study of hazardous waste management of motorcycle repair shops

3.1 Results from the study of hazardous waste storing of motorcycle repair shops

From the study on hazardous waste storing of motorcycle repair shops by using interview, observation, and taking photos of 10 random selected motorcycle repair shops from purposive sampling, the results displayed in table 2.

**Table 2** shows the results on storing methods hazardous wastes incurring in 10 samples of motorcycle repair shops, which are correctly and incorrectly according to academic theories (require improvement)

Correct storing method according to academic theory		Incorrect storing method according to academic theory (Require improvement )	
Engine oil, gear oil, lubricant oil		Tyre, inner tube	
 <p>Oil bucks for storing engine oil, gear oil, and lubricant oil</p>	 <p>Oil bucks for storing engine oil, gear oil, and lubricant oil</p>	 <p>Used tyre and inner tubes of motorcycle are stack up in front of the shops</p>	 <p>Used tyre and inner tubes of motorcycle are stack up in front of the shops</p>

**Table 2** shows the results on storing methods hazardous wastes incurring in 10 samples of motorcycle repair shops, which are correctly and incorrectly according to academic theories (require improvement) (con't)

Rustproof and paint spray can		Electrical wire	
 <p>Paper box for storing rustproof and paint spray cans</p>	 <p>Sack for storing rustproof and paint spray cans</p>	 <p>Paper box for storing wasted electrical wire</p>	 <p>Metal bucket for storing wasted electrical wire</p>
Motorcycle light		Metal remain	
 <p>Plastic cup for storing decayed and unusable motorcycle lights</p>	 <p>Paper box for storing decayed and unusable motorcycle lights</p>	 <p>Metal bucket for storing metal remains like chains, bearing, and screw</p>	 <p>Paper box for storing metal remains like chains, bearing, and screw</p>
Engine oil and lubricant can		Battery	
 <p>Storing engine and lubricant oil can</p>	 <p>Storing engine and lubricant oil can</p>	 <p>Storing unused battery in a paper box and placed in the shops without any container</p>	 <p>Storing unused battery in the shops without any container</p>

The results from the study of methods in storing hazardous waste from motorcycle repair shop shows that a strong closed container for each type of hazardous wastes is required in order to prevent spilling, leakage, and contamination to environment. In case of clothes contaminated with oil stains must be disposed of properly by sending to the factory that receives hazardous waste disposal to be burned in a high temperature incinerator.

3.2 The study of hazardous waste management of motorcycle repair shop

1) The study of respondents' general information

From the study on respondents' general information, it shows that there are more male respondents than female ones, which is accounted for 85.45 percent of all respondents. The age of respondents between 40-49 years is accounted for 50.9 percent due to the suitability of men in serving in motorcycle repair shops than women and right age for owning a business. The level of education of most respondents are in Vocational Certificate and High Vocational Certificate level, which are accounted for 45.45 percent, as providing motorcycle repair services requires specific knowledge. Therefore, choosing to study in Vocational Certificate and High Vocational Certificate levels is more suitable for working in his field. The length of business operation mostly between 11-15 years, which accounted for 32.73 percent. Mostly, the average number of motorcycles to repair is 16-20 motorcycles a day. Most of the shops provide services for motorcycles including changing tyre, changing inner tube, discharging engine oil, changing brake lining, battery, lights, spark plug, brake oil, ring, gear oil, stretching and changing chain, and changing bearing the most, which accounted for 100 percent.

2) Results from the study of methods in hazardous waste management of motorcycle repair shops

Methods in managing hazardous waste of 55 motorcycle repair shops in Phuket municipality area, Mueang Phuket, Phuket province, we found that eliminating hazardous waste by selling to waste buying companies is the most used method for used engine oil, metal remains, chain, lubricant oil, and gear oil, which is accounted for 100 percent. This is due to used engine oil, lubricant oil, and gear oil can be sold to decrease quantity of waste. For metal remains, there are garbage sorters come to buy at the shops because metal remains can be melt to produce the same or different product. This is relevant to the study of Jintana Petchwang [7] who conducted a study on hazardous waste management of garages in Mueang district, Phuket province. The study shows that selling to waste buying companies is the most used method for hazardous waste management of garages in Mueang district, Phuket province. The items with highest sales are engine oil, lubricant oil, and metal remains.

3) The study of problems, obstacles, and suggestions in managing hazardous waste of motorcycle repair shops

The study of problems, obstacles, and suggestions in managing hazardous waste of motorcycle repair shops shows that most of the respondents do not have any problems in managing hazardous waste, which accounted for 83.64 percent. The problems that found the most in managing hazardous waste in motorcycle repair shops are lacking of bin for hazardous waste, which accounted for 52.73 percent. This is due to hazardous waste management in most shops do not have bin for hazardous waste. If the municipality or related organizations

provide bins for hazardous wastes to these shop, it can reduce contamination, spilling, and leakage, as well as it can be disposed correctly and not contaminate the environment.

The study on the causes of incorrect methods of hazardous waste management shows that most of the respondents think that the lack of discipline is the major cause of incorrect methods of hazardous waste management, which accounted for 85.47 percent. This is relevant to the study of Chainarong Phanomtheerakiat. In managing hazardous wastes, it is required to classify the type of hazardous waste in order to make it easier for disposal. The disposal can be complicated for operators. So, most of the operators dispose hazardous waste with other wastes like plastic bags and papers. From these reasons, it caused operators to become lacking of discipline in managing hazardous waste.

#### **Suggestions from motorcycle repair shop operators**

1) For managing hazardous waste of motorcycle repair shops in Phuket municipality area, Mueang district, Phuket province, there should be specific bins to classify the type of hazardous waste.

2) Phuket municipality in Mueang district, Phuket province should take a serious action in managing hazardous waste.

3) All operators request for related organizations to provide knowledge for managing hazardous waste from motorcycle repair shops, as some of the operators still lack of knowledge and understanding in managing hazardous waste from their shops.

4) Motorcycle repair shop operators should participate in responsible for disposal of hazardous waste and be disciplined in working

on classifying type of wastes to ease the disposal process.

5) In buying hazardous waste from operators, buying companies should be legally registered. Moreover, the companies should concern on safety in collecting and transporting hazardous waste to prevent leakage and contamination to the environment.

#### **Conclusion**

The study on hazardous waste management of motorcycle repair shop in Phuket municipality area, Mueang district, Phuket province shows that the types of hazardous waste mostly found are 1) engine oil, 2) tyre, 3) inner tube, 4) grease can, and 5) engine oil can, which accounted for 100 percent. Quantity of hazardous waste consists of engine oil, gear oil, and lubricant oil in total 443.80 liters, tyre in total 624 pieces, and inner rubber in total 2,431 pieces. In terms of methods in managing hazardous waste, we found that for storing hazardous waste, used oil bucket are used to store engine oil, which is the best method to reduce contamination. For used tyre and inner tube, they are stacked up in the shops without any container, which this method needs to be improved in order to reduce contamination. For types of waste that are mostly eliminated by selling to waste buying companies are engine oil, metal remains, chain, lubricant oil, and oil. Type of wastes disposed to municipality bins the most are loaves with engine oil stain and used face mask. The most reused wastes are working cloth with engine oil stain. The most sold wastes are lubricant can and engine oil can. Wastes disposed by putting in closed garbage bags and placed by



with engine oil. The study on problems and obstacles shows that lacking discipline in managing hazardous waste is the main cause of incorrect hazardous waste management. The study on suggestions for hazardous waste management shows that most operators suggest to have specific bins to classify hazardous wastes.

In this study, it is a collection of hazardous waste from motorcycle repair shops once a week for 3 months, which is the amount of accumulated waste per cycle. And the researcher did not collect the number of customers who came to use the service. Therefore can not compare the proportion of customers who use motorcycle repair service with the amount of waste from motorcycle repair shops that occurred.

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