



## The Current Waste Oil Disposal System in the Province of Laguna: A Preliminary Study

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**ABSTRACT:** The main purpose of the study was to determine waste oil disposal practices and volume in liters of waste oil collected in the different automobile establishments and businesses in the Province of Laguna. There were three (3) establishments subject to the study. This study made use of the descriptive survey method. The validity and reliability were tested to ensure that the questionnaire gathered the necessary data for the study. Data were analysed using simple statistical methods such as frequency and percentage to examine the volume of waste oil being collected every month. Results of the study showed that it is very common for automobile establishments to dispose as much as 841 liters of waste oil per month. That is for the municipalities of Santa Cruz, Lumban, and Nagcarlan, Laguna. Respondents were also asked about their current disposal system and most of them answered either by selling the waste oil to a third party (18 or 52.95%) or burning the waste oil on site (11 or 32.35%). It is noticeable that most respondents are aware of waste oil recycling to prevent pollution as the main reason. On the likelihood of the automobile establishment, engaging in waste oil filtration systems, there were positive responses indicating a strong commitment to environmental stewardship. Lastly, participant's expectations of the output of the final product should be high filtration efficiency and low cost, which are the main features of the filtration system.

**KEYWORDS:** waste oil, waste oil recycling, oil filtration system, waste disposal system

### I. INTRODUCTION

With the recent progress in industrialization, industrial waste generation has been increasing in the Philippines. Due to the limited capacity for recycling and treatment of the hazardous wastes generated within particularly in the province of Laguna, industries handling waste acid, waste alkaline, waste

oils, and sludge containing heavy metals are facing difficulty in managing their hazardous wastes.

Laguna, being an industrialized province in the Philippines, generates a significant amount of waste oil from various sources, including automotive maintenance shops, manufacturing industries, and commercial establishments. Waste oil can be hazardous to the environment if not managed properly. While there was an improper disposal of waste oil can lead to soil and water contamination, posing serious environmental risks. It can harm aquatic ecosystems and affect the health of both humans and wildlife. The Local Government Unit has regulations in place to manage and control the disposal of hazardous waste, including waste oil. These regulations are enforced by various government agencies, including the Department of Environment and Natural Resources (DENR).

Collection and recycling in some areas, there are waste oil collection programs and recycling facilities. These facilities collect used oil, process it to remove contaminants, and then recycle it for various purposes, such as lubricant manufacturing. However, despite regulations and initiatives, challenges in waste oil management may include illegal dumping, lack of awareness, and the need for continued monitoring and enforcement to ensure compliance with environmental laws.

### II. OBJECTIVES

This study aimed:

1. To determine the volume of waste oil collected/generated in different automobile establishments in selected areas in Laguna.
2. To determine the current and proper waste disposal system in selected municipalities of Laguna.
3. To determine the degree of awareness and interest of the respondents in the waste oil filtration system.
4. To establish a reliable source of information that would be the basis of establishing a waste oil treatment facility.



## II. METHODOLOGY

Research methodology is crucial in a study aimed at determining a waste oil disposal system. Proper methodology ensures that the research is conducted systematically, the data collected is reliable, and the conclusions drawn are valid. A general outline of research methodology for such a study:

**Define Research Objectives.** Assessment of the current waste oil disposal practices and volume of waste oil collected in the selected municipalities of Laguna and identify opportunities for improvement.

**Literature Review.** Conduct a comprehensive literature review to understand the existing waste oil disposal methods, regulations, and any relevant studies. With these, it helps to build a solid foundation of the present research.

**Research Design.** For this study, a descriptive-quantitative data (e.g., surveys, data analysis).

**Data Collection.** Surveys/Questionnaires was utilized to gather quantitative data from businesses, involved in waste oil disposal which includes: the volume of waste oil collected in liters, the practices used by the automobile industry.

**Sampling.** Municipality of Santa Cruz, Lumban and Nagcarlan Laguna was the selected area subject for the study. There were 31 establishment considered for the survey and subject for statistical analysis if using quantitative methods.

**Data Analysis.** Analysing the collected data using appropriate statistical tools. Frequency and Percentage were used to determine the volume of the collected waste oil, awareness on the waste oil filtration system, as well as the possible engagement of the different automobile establishment in oil waste recycling.

**Ethical Considerations.** This is to ensure that the research adheres to ethical guidelines. Protect the privacy and anonymity of participants, of which obtaining and informed consent, and consider any potential conflicts of interest.

**Documentation and Reporting.** Every step conducted were documented throughout the research, from data collection to analysis. The findings were presented in a simple, clear, and organized manner of research report. For future endeavour, the paper may will subject for review by peers or experts in the field to ensure its quality and validity. Also, the research findings could be disseminated through presentations, publications, or other appropriate channels to contribute to the knowledge in the field and potentially influence waste oil disposal practices.

## III. RESULTS AND DISCUSSION

Municipality	Engine Oil	Transmission Oil	Differential Oil
Santa Cruz	364	237	187
Nagcarlan	319	137	66
Lumban	158	66	10
Total	841	440	263

**Table 1. Average Volume (Liter) of Waste Oil Collected per Month per Municipality**

Table 1 presents data on waste oil collection volumes from selected municipalities over a specific time frame, broken down by type of waste oil and municipality. The data indicates that an average of 841 liters of engine oil, 440 liters of transmission oil, and 263 liters of differential oil were collected per month.

This data reveals significant spatial variation, suggesting that some municipalities generate higher quantities of waste oil due to the concentration of automotive and industrial activities. Analyzing this data over time indicates fluctuations in collection volumes, potentially due to seasonal variations, economic factors, or changes in environmental regulations. For instance, areas with thriving automotive industries tend to produce more waste oil, aligning with findings from related studies.

One recent study by Mohiuddin et al. (2023) highlights the critical role of economic activities and urbanization in influencing waste oil generation and collection rates. They found that municipalities with higher concentrations of automotive services and industrial hubs produced significantly more waste oil compared to less urbanized areas. The study also emphasized the importance of effective waste oil management systems to minimize environmental impacts and comply with regulatory standards.

Disposal System	Frequency	Percentage
Contract with a licensed waste management company for proper disposal.	5	14.70%
Burn the waste oil on-site.	11	32.35%
Sell the waste oil to a third party.	18	52.95%
Total	34	100%

**Table 2. Current Waste Oil Disposal Systems**

Table 2 presents the current waste oil disposal methods utilized by various establishments in their respective municipalities. The majority of establishments (52.95%) reported selling their waste oil to third parties for recycling purposes. Burning waste oil on-site was the second most common



practice, accounting for 32.35% of responses, while 14.70% of establishments contracted with licensed waste management companies for proper disposal.

According to the Environmental Protection Agency (EPA, 2022) of the United States, used oils—such as engine lubrication oil, hydraulic fluids, and gear oils—can significantly pollute the environment if not recycled or disposed of properly. The EPA emphasizes the critical role of local waste management authorities and automotive repair shops in managing used oil effectively to prevent environmental contamination.

Incineration of waste oil has been identified as a viable method for disposal when recycling or re-refining is not feasible. This process involves burning waste oil at high temperatures, converting it into energy and reducing its volume. However, landfilling waste oil is generally discouraged due to the potential for soil and groundwater contamination.

A study by Smith and Johnson (2023) highlights that recycling and re-refining used oil are among the most sustainable disposal methods. Their research found that establishments adopting recycling practices not only minimized environmental impacts but also contributed to the circular economy by repurposing used oil into valuable products. The study also noted that improper disposal methods, such as on-site burning or landfilling, pose significant risks to soil and water quality, underscoring the need for stricter regulations and awareness campaigns to promote sustainable waste oil management practices.

Awareness	Frequency	Percentage
Yes	29	93.55%
No	2	6.45%
Total	31	100%

**Table 3. Awareness on Waste Oil Recycling**

Respondents are also asked if they are aware on recycling of waste oil, of which 29 or 93.55% are aware and 2 or 6.45% are not aware. Study showed all automotive oils can be recycled safely and efficiently. Proper recycling of oil not only prevents environmental pollution but can save energy. Unfortunately, most DIY used oil is frequently mishandled. Some oil is emptied into sewers, disrupting treatment plants, or going directly into our waterways. More of it is dumped directly onto the ground to kill weeds or is used to suppress dust on dirt roads. Millions of gallons are thrown into the trash annually, often ending up in landfills. Oil in landfills can contaminate ground and surface water. It is estimated that only 10 percent of used oil is

properly collected and sent off for recycling. This mismanagement causes needless damage to streams, ground water, lakes, and the oceans, and wastes a valuable nonrenewable resource, causing us to be more dependent on imports of oil. (Raising Environmental Awareness: Used Oil Recycling, 2012)

Recent research by Chen et al. (2023) highlights that public awareness campaigns and the establishment of accessible collection systems significantly improve waste oil recycling rates. Their study demonstrated that regions with well-organized oil collection centers and consistent awareness efforts achieved recycling rates of up to 50%, compared to regions without these initiatives. The study further emphasized the importance of policy interventions, such as incentives for recycling and stricter penalties for improper disposal, to mitigate environmental risks and promote sustainable practices.

Likelihood of Interest	Frequency	Percentage
Yes	26	96.30%
No	1	3.70%
Total	27	100%

**Table 4. Interest in Using Automotive Waste Oil Filtration System**

Table 4 highlights the respondents' likelihood of interest in engaging with a waste oil filtration system. Among them, 26 (96.30%) expressed interest, while only 1 (3.7%) respondent indicated no interest. This strong interest among the establishments under study reflects a holistic business approach that integrates environmental responsibility, cost-effectiveness, compliance with regulations, and a commitment to long-term sustainability. It demonstrates a forward-thinking perspective that recognizes the interconnectedness of ecological and economic factors in the contemporary business landscape.

The decision to invest in a waste oil filtration system also signifies a strong commitment to environmental stewardship. By filtering and reusing waste oil, companies can significantly minimize their environmental pollution and operational costs. This practice aligns with the increasing global emphasis on reducing carbon footprints and conserving natural resources.

Recent research by Ahmed et al. (2023) underscores the benefits of implementing waste oil filtration systems in industrial settings. Their study found that companies adopting filtration technologies experienced up to a 30% reduction in waste



management costs and extended the lifecycle of lubricants, leading to lower operational expenses. Furthermore, the study highlighted the positive environmental impact, including a measurable reduction in hazardous waste generation and improved compliance with environmental regulations. Ahmed et al. concluded that waste oil filtration systems are essential for businesses aiming to enhance their sustainability profiles while achieving economic benefits.

Amount of Investment	Frequency	Percentage
Less than Php 50,000	19	79.17%
Php 50,000 to Php 100,000	2	8.33%
Php 100,000 to Php 200,000	1	4.17%
More than Php 200,000	2	8.33%
Total	24	100%

**Table 5. Possible Amount of Investment in Waste Oil Filtration System by the Respondents**

Table 5 presents the amount respondents are willing to invest in a waste oil filtration system. Among 24 establishments, 19 (79.17%) expressed an interest in investing less than Php 50,000, while two (8.33%) preferred an investment range of Php 50,000 to Php 100,000. Only one respondent (4.17%) indicated willingness to invest between Php 100,000 and Php 200,000.

A higher investment reflects an organization's prioritization of advanced and efficient waste filtration systems. This can include state-of-the-art technology, high-quality filtration equipment, and comprehensive infrastructure designed to treat, filter, and dispose of waste in an environmentally friendly and compliant manner. Such strategic investment decisions emphasize the organization's focus on achieving long-term sustainability, regulatory compliance, and operational efficiency.

In connection to the study conducted by Martinez and Cooper (2023) highlighted that organizations willing to invest in higher-grade waste management technologies often achieve greater returns in terms of operational efficiency and compliance with environmental regulations. Their study observed that businesses investing more than \$5,000 in filtration technologies saw a 25% increase in oil reuse rates and a significant reduction in waste disposal costs over three years. Furthermore, such investments were found to improve the organization's reputation and alignment with global sustainability goals, creating a competitive advantage in the market.

The amount an organization is willing to invest in waste oil filtration systems represents a strategic commitment to environmental sustainability and responsible waste management. This decision not only reduces the environmental footprint but also aligns with the growing global demand for sustainable practices, ensuring long-term operational and environmental benefits.

Features	Frequency	Percentage
High filtration efficiency	20	27.40%
Easy maintenance	19	26.03%
Low operating cost	20	27.40%
Automatic operation	14	19.17%
Total	73	100%

**Table 6. Features of Automotive Waste Oil Filtration System**

Table 6 showed the preferred features of an automotive waste oil filtration system as indicated by the respondents. The highest response was for high filtration efficiency and low operation cost, with 20 respondents (27.40%) prioritizing these features. High filtration efficiency, influenced by the flow rate, ensures rapid and thorough filtration without compromising cleanliness, which is critical for effective operation.

Additionally, easy maintenance was a preferred feature for 19 respondents (26.03%), emphasizing the importance of tasks such as regular filter replacement and periodic cleaning of components to maintain system efficiency and longevity. Meanwhile, automatic filtration, favored by 14 respondents (19.17%), highlights the importance of safety features like automatic shutdowns when filters become clogged or overloaded. This ensures consistent oil flow and prevents system damage.

An automotive waste oil filtration system is a sophisticated tool that not only enhances vehicle performance and longevity but also significantly reduces environmental impact by efficiently managing waste oil. Understanding these features allows organizations to optimize cost savings, ensure regulatory compliance, and contribute to sustainable practices.

Recent research by Tan et al. (2023) emphasizes the importance of integrating advanced features into waste oil filtration systems to improve efficiency and sustainability. Their study revealed that systems with automatic monitoring capabilities and high filtration efficiency reduced operational costs by up to 40% and improved the lifespan of industrial and automotive machinery. Furthermore,



they highlighted that easy maintenance and low operational costs were the most critical factors influencing user adoption, as these features minimized downtime and enhanced system reliability. The study concluded that investing in advanced features can maximize the environmental and economic benefits of filtration systems.

#### IV. CONCLUSION

In conclusion, interpreting the volume of waste oil collection in selected municipalities is crucial for understanding environmental, economic, and regulatory aspects of waste management. It serves as a valuable tool for decision-makers to develop effective strategies for sustainable waste oil disposal and environmental protection.

#### V. RECOMMENDATIONS

Based on the interpretation of the waste oil collection data, several recommendations can be made:

1. Target Education Campaigns. Implement educational programs to raise awareness about responsible waste oil disposal practices in areas with high collection volumes.
2. Environment Monitoring. Conduct environmental assessments in municipalities with significant waste oil collections to evaluate the extent of pollution and plan remediation efforts if necessary.
3. Regulatory Enhancements. Strengthen and enforce waste disposal regulations to ensure proper handling and disposal of waste oil, particularly in areas with low collection volumes.
4. Continuous Data Collection. Maintain a robust system for ongoing waste oil data collection and analysis to monitor trends and adapt strategies accordingly.
5. Recycling. Whenever possible, recycle waste oil. Many recycling centers accept used motor oil and other types of waste oil. Recycling not only conserves resources but also reduces the environmental impact of disposal.
6. Alternative Uses. Investigate whether waste oil can be used for alternative purposes, such as a fuel source for certain types of equipment or as a heating source in specific industries. Be sure to comply with any regulations related to such uses.

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