Abstract: The problem of waste in the tourism area is one of the crucial issues that must be addressed immediately. The performance of the waste management system is not optimal, marked by the number of waste that is not managed properly in the tourism area. The purpose of this study is to conduct a study of the generation and composition of waste in general and to determine the potential and appropriate handling of plastic waste. The Pananjung Village as a beach tourism destination of waste generation as much as 5387.83 kg/day with a source of non-domestic waste generation in the form of hotels, restaurants, homestays, traders, street, beach, and tourists. The total composition of plastic waste 10.11% which is divided into two groups of plastic. The recycled plastic group is Polyethylene Terephthalate (PETE) plastic 1.62%, 0.02% High-Density Polyethylene (HDPE), 0.53% Polypropylene (PP) type, 2.16% Polyethylene (PE) type, this plastic handling is recycled by made new plastic products according to its type. While the types of plastic that cannot be recycled include 2.14% Plastic Bags, 0.34% Polystyrene (PS) and 3.30% other types of plastic. Plastic bag handling is done by pyrolysis technology. Fuel oil from the plastic bag pyrolysis process is included in the category of gasoline with C₅ to C₁₂ hydrocarbon chains.

Keywords: waste generation, waste composition, plastic waste, pyrolysis

1. Introduction
One indicator of waste management that is less than optimal in tourist areas is characterized by dirty tourist areas due to a large amount of untreated waste. According to [1], waste management problems are caused by a lack of waste management infrastructure, lack of knowledge and lack of collaboration with community-based waste management. Another obstacle in waste management is the unavailability of the latest waste generation data, making it difficult to project the performance of waste management to be carried out [2].

Plastic plays an important role in our daily lives due to its versatility, lightweight and low production cost [3], [4]. Consumption of plastics increasing drastically year by year there is a problem with plastics [5]. Contamination of the marine environment by human-made plastic litter is a growing and global problem [6] and this litter results in a wide range of potential impacts on the environment [7], [8]. The estimation that 275 million metric tons (MT) of plastic waste was generated in 192 coastal countries in 2010, and predicted to increase by an order of magnitude by 2025 [9]. Crackle plastic bags have become a part of human life and are difficult to separate [10]. It is estimated that each person consumes 170 plastic bags each year and around 500 billion to one trillion plastic bags are used worldwide. Plastic is also an organic material composed of chemicals that are quite dangerous for the environment. Plastic waste is very difficult to be deciphered naturally [11], to decipher plastic waste requires approximately 80 years to be completely degraded [12].

Pananjung beach is one of the tourist destinations, if the problem of garbage in the tourist area is not handled properly it will be able to reduce aesthetic value and cause cleanliness problems in the tourist area. One way to develop plastic waste treatment is to convert it into fuel. Therefore, we need a method that can process waste but does not cause other new problems. One method of processing waste that has been developed, the pyrolysis method. Pyrolysis is widely seen as a promising technology for converting plastic waste into a wax/oil product which can be used as a heavy fuel oil substitute or as raw material by the petrochemical industry [13].
2. Research Methods

2.1 Research Location

The research location is a beach tourism area located in Pananjung Village, Pangandaran Regency, and West Java Province.

2.2 Data Collection

1) Measurement of waste generation and composition in the Pananjung village area is done through sampling at the source of waste generation for 8 consecutive days using a sampling box measuring 20 x 20 x 1000 cm, concerning [14] concerning Methods for Taking and Measuring Examples of Urban Waste Increment and Composition.

2) Measurement of waste composition is done by separating waste based on its type then weighed. Types of waste are grouped into kitchen waste, garden waste, plastic, paper, metal, rubber, cloth, glass, nappies, hazardous and other types of waste.

2.3 Data Analysis

1) The analysis carried out is a material balance to see the potential form of recycling in each type of plastic waste.

2) Physical test of fuel oil from the plastic pyrolysis process, namely: viscosity, density, flash point, and calorific value [15].

3) Chemical test of oil from plastic pyrolysis by using Gas Chromatography-Mass Spectrometry (GC-MS) [16], [17].

3. Result and Discussion

3.1 Waste Generation

The total amount of waste generation in Pananjung Village based on measurements of hotels, homestays, restaurants, trader, roads, beaches and tourists is 5387.83 kg/day or 15.94 m$^3$/day (with an average density of 338 kg/m$^3$).

3.2 Waste Composition

Waste characterization is the first step to any successful waste management policy [18] and fundamental importance not only for emissions during waste treatment [19]. The highest composition of waste is kitchen waste (27.19%), organic waste is generated due to the extensive use of food [20]. garden waste (22.45%), plastic waste (21.99%), then paper type waste (14.7%). The best way to reduce waste by changing human behavior toward waste management [21]–[23], by sorting waste from the household. Waste sorting can affect recycling rates [24]. According to [25] waste sorting can reduce the amount of waste as much as 30%. The details of the composition of waste based on measurement results as in Table 1.

| Type of Waste | Komposition (%) |
|---------------|-----------------|
| Kitchen Waste | 39.07           |
| Parks         | 22.45           |
| Plastic       | 10.11           |
| Paper         | 14.7            |
| Metal         | 1.45            |
| Rubber        | 0.52            |
The amount of plastic waste as much as 10.11% is then sorted again based on the type of plastic, namely Polyethylene Terephthalate (PETE), High-Density Polyethylene (HDPE), Polypropylene (PP), Polyethylene (PE), Plastic Bags, Polystyrene (PS) and other types of plastic. Then all types of plastics are grouped again into groups of recyclable plastic waste and plastic waste that cannot be recycled. Plastic waste groups that can be recycled include Polyethylene Terephthalate (PETE), High-Density Polyethylene (HDPE), Polypropylene (PP) and Polyethylene (PE), the total types of these plastic groups are 233.29 kg/day. Whereas the group of plastic waste that cannot be recycled includes plastic bags, Polystyrene (PS) and other types of plastic with a total of 311.42 tons/day. Detailed composition and weight of each type of plastic waste as shown in Table 2.

| Plastic Type                           | Composition (%) | Weight (kg/day) | Information   |
|----------------------------------------|-----------------|-----------------|---------------|
| Polyethylene Terephthalate (PETE)       | 1.62            | 87.28           | reusable      |
| High-Density Polyethylene (HDPE)       | 0.02            | 1.08            | reusable      |
| Polypropylene (PP)                     | 0.53            | 28.56           | reusable      |
| Polyethylene (PE)                      | 2.16            | 116.38          | reusable      |
| Plastic Bags                           | 2.14            | 115.30          | nonreusable   |
| Polystyrene (PS)                       | 0.34            | 18.32           | nonreusable   |
| Others Plastic                         | 3.30            | 177.80          | nonreusable   |
| Total                                  | 10.11           | 544.71          |               |

This type of recycled plastic waste is used as raw material to make new plastic products based on its type. The type of plastic waste that cannot be recycled like other types of plastic waste can be handled by making eco-bricks and other handicrafts. Whereas plastic bag waste can be handled by processing using pyrolysis technology.

### 3.3 Pyrolysis

The plastic waste cracking process in this study uses the pyrolysis process which is one of the cracking processes using high temperatures without the presence of limited air or air. In this study, the pyrolysis process uses an optimal temperature of 300°C with a sample of polypropylene type plastic waste with a sample mass of 3 kg.

The thermal and catalytic processes of converting waste plastics into fuels are promising techniques to eliminate the refuse which otherwise is harmful to the environment and decreases the dependence on fossil fuels [26]. Oil from the pyrolysis process of the plastic had a high calorific value [27]. The oil obtained by the pyrolysis of waste plastics can be used as an alternative fuel for a diesel engine without making any modification to the engine [28].
The starts of the pyrolysis process in plastic waste are marked by the release of fuel oil produced through the outlet pipe in the reactor. Fuel oil from the reactor starts in the 110th minute with a reactor temperature of 170ºC. Effect of temperature and time on the amount of oil in the pyrolysis process as in Fig.2.

![Fig. 2. Effect of temperature and time on the amount of oil in the pyrolysis process](image)

The reduction of plastic waste using pyrolysis technology can reduce the volume of plastic waste by up to 96% with a residue of 4% of the 3 kg amount of waste. The amount of fuel oil produced was 477.5 ml. The results of physical testing of fuel oil from the plastic pyrolysis process have a viscosity value of 0.828 cSt, density 0.88 gr/ml, flash point 42°C and calorific value of 11.819 Cal/gr. according to the [29], if the high calorific value is a significant increase compared to conventional diesel fuel.

Based on GC-MS testing on oil pyrolysis plastic fuel samples that the oil contains many compounds, it can be seen from the number of peaks in the GC spectra. Pyrolysis oil chromatogram as Fig. 3.

![Fig 3. Results of GC-MS analysis of plastic pyrolysis fuels](image)
Table 3. The fraction of plastic pyrolysis oil content resulted from GC-MS analysis

| Retention Time | % area | Compound Description | Formula |
|----------------|--------|----------------------|---------|
| 1.885          | 2.26   | Cyclohexane (CAS) Hexanaphthene | C₆H₁₂ |
| 3.954          | 4.57   | Heptane, 4-methyl- (CAS) 4-Methylheptane | C₇H₁₈ |
| 5.943          | 2.24   | Cyclohexane, 1,3,5-trimethyl- | C₉H₁₈ |
| 6.146          | 3.43   | 2-Heptene-4-one, 2-methyl- | C₇H₄O |
| 6.593          | 19.15  | 2,4-Dimethyl-1-heptene | C₉H₁₈ |
| 7.075          | 3.23   | Cyclohexane, 1,3,5-trimethyl- | C₉H₁₈ |
| 9.428          | 3.12   | 2-Pentanone, 3-[(acylxy)methyl]-3,4-dimethyl | C₅H₁₀ |
| 13.979         | 2.04   | 1-Decene | C₁₀H₂₀ |
| 14.503         | 2.49   | Heptane, 2,5,5-trimethyl- (CAS) 2,5,5-Trimethylheptane | C₁₀H₂₂ |
| 14.623         | 2.56   | Decane, 4-methyl- (CAS) 4-Methyldecane | C₁₀H₂₄ |
| 16.247         | 2.90   | 1-Decene, 2,4-dimethyl- | C₁₀H₂₄ |
| 20.444         | 2.44   | 2-Isopropyl-5-methyl-1-heptanol | C₁₁H₂₄O |

The fraction contained in pyrolysis oil type plastic bags according to Table 3. It has a range of C₅-C₁₂ hydrocarbon bonds. This result can be concluded that the oil resulting from the pyrolysis process of plastic bags is close to the gasoline type of fuel oil which is composed of C₅ to C₁₂ hydrocarbon chains [30], [31]. The characteristics of HDPE and PP pyrolytic sample oils are similar to conventional transportation fuel [32], [33]. Oil product of the plastic pyrolysis is potential as an alternative energy source for electricity generation [34].

4. Conclusion

Knowing the generation and composition of waste will make it easier to handle waste, especially in recycling and determining waste processing technology. The activity of recycling waste that can be renewed greatly impacts on environmental cleanliness in the form of a reduction in the form of recycling to make new plastic products according to its type, while also having an economic impact on the surrounding community. In principle, pyrolysis technology is very good as a solution to reducing plastic waste. Besides being able to reduce the amount of plastic waste in an environmentally friendly way, the pyrolysis of plastic waste also obtained by-products in the form of fuel oil with gasoline category C₅ to C₁₂ hydrocarbon chain.

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