

Pet Bottle Recycling at PT. Calista Prima Piranti Indah

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Abstract

The discovery of plastic as a useful and convenience material for human life has turned into a threat to society because plastic has also become a habitat with the human ecosystem. Plastic that is made by human can live longer than human as it is uneasily degradable. Thus, it is important to find possible ways to extinguish or reuse plastic bottle waste. Recycling it into useful raw materials that can be used for many sectors in the economy is one possible step. This paper shows importance of plastic waste recycle especially plastic bottles through the practice of PT. Calista Prima Piranti Indah involving in recycling plastic bottles into reusable bottles.

Keywords: plastic, waste, recycling

INTRODUCTION

The development of plastic products throughout the world has been very rapid over time and has penetrated almost all types of human needs, from basic needs such as household needs, accessories for luxury cars, to packaging tools for food and drinks (Sahwan et al., 2005). In Indonesia, plastic is generally used more for packaging food and beverage products. For beverage product packaging, plastic is made into glasses or plastic bottles that are easy to carry and do not break easily and leak. Because of these advantages, plastic has become a superior material for making beverage packaging.

However, plastic bottles also have a weakness, namely that they can only be used once. This causes plastic bottles to produce quite a lot of waste in Indonesia. In 2023, Indonesia will produce around 18.77% of plastic waste from all types of waste produced. Making plastic waste the second largest waste produced by Indonesian society.

Plastic (PET) bottles are very detrimental to the environment and humans because they are made from materials that are difficult to decompose. Just one plastic bottle takes hundreds of years to decompose completely, which causes plastic bottle waste to accumulate in landfills.

Even when it has decomposed, plastic bottle waste can also cause negative impacts on the surrounding soil because the disposal of plastic bottles is contaminated with chemicals from plastic bottles which are very dangerous for soil fertility and also for human physical health. The dangers that plastic bottle waste can cause to humans are respiratory problems, damage to body tissue, and triggers of cancer (Karuniastuti, 2013).

For this reason, it is necessary to implement Reduce, Reuse and Recycle on plastic bottles so that there is no accumulation of plastic bottles, and the chemicals in plastic bottles do not pollute the soil and the human physical body as has been said. Explained above. Reduce, Reuse, Recycle activities can be abbreviated as 3R.

Reduce is an effort/activity to reduce the use of goods in order to prevent the accumulation of rubbish/waste in the surrounding environment (Norken & Harmayani, 2019). In this case, reducing plastic bottle waste can be done by using drink bottles made for the long term (for example the Tupperware), using/buying drinks in other packaging, such as cans, etc.

Reuse is an effort/activity to reuse items that have been used so that they do not become waste (Norken & Harmayani 2019). In this case, reusing plastic bottles can be done by making plastic bottles into refillable soap and shampoo packaging. Apart from that, plastic bottles can also be reused as pots for several types of plants such as avocado.

Recycle is an effort/activity to recycle goods that are no longer used into goods that are ready to be used again (Norken & Harmayani 2019). In this case, plastic bottles can be recycled in two ways, namely mechanically and chemically. Mechanical recycle is done by

changing used plastic bottles into recycled plastic bottles which can later be produced and reused. Meanwhile, chemical recycling is carried out by mixing a cobalt or manganese-based oxygenation reaction with plastic bottles to break down the polymer chains in the plastic bottles. Apart from the oxygenation reaction, chemical recycling can also be done by placing *Pseudomonas putida* microbes/bacteria in plastic bottles. These bacteria will consume oxygenated organic molecules and cause the plastic bottle to decompose.

In the mechanical recycling process, there are three parties who play a role in making plastic bottles can be reused. The first party is stall. A stall is obliged for collecting discarded plastic bottles which will then be sent to the recycling factory. The second party is recycling factory. The recycling factory is to clean, inspect, and change the size of plastic bottles for being ready to be sent to beverage manufacturing factories. The third party is beverage manufacturer which checks and selects plastic bottles that meet beverage packaging requirements and convert the recycled plastic bottles into ready to use ones.

PT. Calista Prima Piranti Indah is one party that has involved in recycling plastic bottle (PET). It plays the role as the second party in the plastic bottle recycling stage by cleaning, checking, sorting and pressing the used plastic bottles, and selling them to beverage factories. The company involves in this business because the need of used bottles is higher, contribution to preserving the environment by reducing the amount of plastic bottle waste. This paper wants to show importance of recycling plastic waste especially plastic bottles in reducing wastes.

LITERATURE REVIEW

Plastic

Plastic is a synthetic organic polymer made from a mixture of petrochemical ingredients. Plastic was first discovered in the early 1900s under the name Bakelite and

developments in polythelene materials in the 1930s meant that the amount and use of plastic increased drastically.

According to Shen and Worrell (2014), plastic has several types: PET (*polyethylene terephthalate*), HDPE (*high-density polyethylene*), PVC (*polyvinyl chloride*), PC (*polycarbonate*), LDPE (*linear low-density polyethylene*), PP (*polypropylene*), PS (*polystyrene*), EPS (*expanded polystyrene*). It can be formed into films or synthetic fibers and can also be used as an additive or coating material in several products that are used in various situations because plastic itself is made from a material that can withstand heat, hardness and almost all threats. This is what makes plastic used in almost all industrial fields in the world. Apart from being a strong material, plastic is also cheap so it is very easy to get and use plastic.

Because of the cheap price and the benefits obtained, many people use products made from plastic to help with their activities. One of them is for wrapping drinks. Plastic material is converted into glasses or bottles to wrap drinks, so people can take drinks anywhere. However, plastic also has a weakness, namely that it can only be used once. This causes a lot of glass or plastic bottles to be thrown away which makes the trash pile up, and ultimately the glass or plastic bottles are thrown into any place which can damage and poison the surrounding environment.

Waste

Waste is residue produced from a business or activity that contains hazardous materials and is toxic because of its nature, concentration and amount which can harm the environment and living creatures around it (Dirgantoro, 2017). Materials that are often found in waste are organic compounds that are biodegradable, volatile and difficult to decompose. Apart from these organic compounds, materials that can be found in waste include heavy

metals that are toxic and difficult to decompose, suspended solids, pathogenic microbes and parasites.

According to Abdurachman (2006), waste can be categorized into three based on its form (Dirgantoro 2017). First, solid waste is waste that has a solid form, is dry, and cannot move on its own, unless there is the power of a living creature to move it. This type of waste is produced from food waste, wood cutting residue and other solid industrial products that cannot be reused. Second, liquid waste is waste that has a form like water. This type of waste has the property of easily dissolving and mixing in water, and is easy to move around. This type of waste is usually water used by housewives' washing activities, water used by detergent manufacturing industries. Third, gas waste is waste that has a form like gas/wind. This type of waste has the property of always moving and spreading widely in the environment. Examples of gas waste is exhaust gas produced by motor vehicles, industrial factories, etc.

Most types of waste produced are directly disposed of at the Final Disposal Site (TPA). However, there is also waste that is thrown into the environment. This is very detrimental because it can damage the sustainability of the surrounding environment and endanger living creatures.

In order not to damage the environment and poison existing living things, society must take creative steps to reduce consumption of new goods, as well as process residual waste into new resources or tools that can be reused. One example of steps that can be taken to manage waste is by recycling the waste into new resources that can be used again.

Recycling

Recycling is a step created to manage goods that are no longer used or have become waste and turn them into goods that can be reused, and have sales and use value (Rizki,

Yushardi, & Sudartik 2023). Recycling are one of the most effective activities in reducing the amount of rubbish/waste in the surrounding environment, especially plastic rubbish/waste which is often used by people in their daily activities.

There are three types of recycling that can be implemented: primary recycling, secondary recycling, and tertiary recycling. Primary recycling is a recycling activity that changes waste into goods that have the same quality as the previous goods when they were original. An example of primary recycling is changing plastic bottle waste into new plastic bottles, etc. Secondary recycling is a recycling activity that turns waste into new goods that have almost the same quality, but are still below the previous product. Examples of secondary recycling are turning waste plastic bottles into plant pots, turning plastic packaging into raw materials for making bags, and so on. Tertiary recycling is a recycling activity that converts waste into new items with the help of certain chemicals. An example of a tertiary recycling activity is turning plastic waste into raw materials for making clothes.

Implementation of recycling activities can expectantly reduce the amount of existing waste, especially plastic waste which is widely used and popular with the public. Apart from that, it is hoped that recycling activities can make people more creative and have lots of ideas and innovations in preserving the environment.

METHODS

The methods used to collect data was interview that is to obtain correct and valid information about the object under study. The interview was conducted in-person with the key informants on the factory located in Semarang city. The key informants covered the founder and CEO of the company and person in charge/manager of PT. Calista Prima Piranti Indah. The information obtained from the first one includes company profile, brief history, selection

of stalls with which the company wants to work together, average salary, customers, and the community reactions and responses on the presence of the company. The information obtained from the second key informant includes the flow and stages of the plastic bottle recycling operations, working conditions, employee working hours, existing regulations and policies, and when the sales experienced increases and decreases.

On addition to the interview, observation on the process of recycling the used bottles, the working environment conditions, as well as the company environment was also conducted. The data was transcribed and presented to describe the process and highlight the importance of the process in reducing wastes.

RESULTS AND DISCUSSION

The Company Profile

PT. Calista Prima Piranti Indah located in the city of Semarang, Central Java, Indonesia is a limited company engaged in the production of used PET plastic bottles from recycling. The founder also serves as the chairman/CEO of the company.

Initially, PT Calista Prima Piranti Indah was a family-owned company that produced furniture or household furnishings, such as tables, chairs, cupboards and other types of furniture which was founded and led by the father of the current CEO who managed the company afterward. After several years, he decided to close his furniture business as he did not have a passion for the furniture sector and wanted to create a business that is simple, beneficial for the environment, and gives job for the people residing around the company site. A plastic bottle (PET) recycling business was considerably fit with his expectation as it is beneficial for the environment and can give employment opportunities for local residents who

are already retired and have high school education or lower. The business was established in 2016 and kept the name of the furniture business for this new business.

Stages of Plastic Bottle Recycling Process

1. Dismantling and separating the bottles brought from stalls

The first step is to dismantle the plastic bottles that have been brought from the used bottle collection stall in the form of kilo sacks in the dismantling area, then inspect and separate the plastic bottles for mineral water, plastic bottles for soda, sauce, plastic gallons, etc. by the employees there. This is done so that the plastic (PET) bottles or gallons that will later be weighed are sorted based on the classifications.

The selection of stalls was carried out by the CEO himself. The used bottles collected from the stalls were then checked to know whether they met the criteria set by the company or not. If they meet the criteria, an agreement to cooperate with the stall is issued. Otherwise, the bottles are rejected and returned to the stall.

2. Bottle's weighing and marking

After going through the separation process, the bottles are weighed separately. The purpose of this separate weighing activity is so that the person in charge of the field has data about the weight per sack. From this separate weighing activity is so that the person in charge of the field has data about the weight per sack and bottles that will enter the sorting or storage area, as well as providing report to the stall about the tonnage after separation. After being weighed, the sacks are coded with the name of the bottle holder, then taken to the sorting area to be processed and regrouped based on the quality and cleanliness of the bottles, while bottles that are not processed will be taken directly to the Storage Area.

3. Cleaning and sorting PET bottles based on selling value and depreciation

After weighing, the bottles that are directly processed are immediately taken to the Sorting Area for further processing and inspection, such as removing brands and bottle caps (if they are still there), checking the cleanliness of the bottles, etc. This is done because the brand and bottle cap are hard materials and cannot be crushed/pressed when they enter the pressing machine so they must be removed, as well as checking the cleanliness of the bottle so that no dirt enters the pressing machine.

The bottles that have been inspected are then placed on the rolling wheel to be collected separately based on the shape, cleanliness and quality of the bottles. Before being collected, the bottles are checked further, then sorted/separated. From this sorting, Ms. Rhema, who is in charge of the field, will calculate how many bottles are collected and can go to the pressing machine, as well as determining how much all costs must be paid by PT. Calista to the PET bottle supplier according to the weight of each bottle which has been sorted according to the supplier's price. For group division and prices,

Meanwhile, PET bottles that are below standard quality will be separated and grouped separately, then will be checked/inspected again to see whether the bottles are suitable for resale or not (they must be thrown away).

4. Process of pressing, weighing after pressing and providing group barcodes

After being checked for quality and grouped by type, the bottles enter the pressing room. For the pressing stage itself, a fairly large press machine is used which is capable of pressing bottles up to hundreds of kilos in one pressing process. The bottles are pressed according to their grouping so that nothing gets mixed up when they enter the pressing machine. This pressing process aims to ensure that PT. Calista can produce more bottles when they are weighed and sold to customers.

After being pressed, the bottles are weighed and given a barcode containing the type of group of bottles that have been pressed.

5. Process of storing the pressed bottles for sale

After going through the pressing, weighing, and affixing barcode, the bottles are moved from the pressing room to a special storage warehouse according to groups of bottles that have gone through all stages. They are ready to be transported and sold to customers that are large and small companies.

CONCLUSION

PT. Calista Prima Piranti Indah is a limited company that carries out recycling activities by converting used PET bottles into resalable good quality product that can be recycled and reused bottles. All stages carried out by PT. Calista Prima especially on cleaning and sorting ones are highly important as they are the core activities that can ensure the bottles have no remaining dirt or meet the requirements for entering the pressing machine. This way is to maintain the quality of the pressing machine and achieve the main goal to produce qualified recycled plastic bottles for customers.

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