Business Strategy Utilization of Plastic Waste to Produce Fuel Oil as the Implementation of Social Entrepreneurship

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ABSTRACT: *Jakarta Bay's shoreline has become a multipurpose location for tourist, fishing, industry, trade, and a high-traffic international port. This causes Jakarta residents to dump their rubbish in the neighboring waterways. Angke, Sunter, and Ciliwung rivers carry trash to Jakarta Bay. This reduces fishing for most locals, notably on Harapan Island. The Plastic Fuel company must be designed using social entrepreneurship. Interviews and observations collect data. Data processing involves calculating organizational and management elements, cost aspects, production aspects, and economic analysis via R/C Ratio, ROI, Payback Period, Profit, and BEP. Plastic Fuel was profitable with an R/C of 4.17, a reduced selling price of Rp. 6000/liter, and 100 liters of diesel fuel/day, with a payback of 0.09 years.*
KEYWORDS - *Social Entrepreneurship, Fuel Oil, R/C Ratio, Pay Period, BEP*

I.   INTRODUCTION

Jakarta as the nation's capital and the center of the national economy is the center of population density on the island of Java, which is known as one of the most densely populated islands in the world. Demographic data has recorded the city of Jakarta by 10.15 million inhabitants in 2015. The city of Jakarta is directly opposite the Java Sea on its northern edge with a coastline of 35 km. In the open waters, 110 islands can be found that stretch to the north of Jakarta Bay (LIPI, 2017).

Jakarta Bay is a very important water area from an ecological and economic perspective. Ecologically these waters are the support for the ecological system of marine life in the Java Sea. Economically these waters are a place for human life to depend on their livelihood through various activities in Jakarta Bay, especially for fishermen who are very close to Jakarta Bay conditions. The western land boundary of Jakarta Bay is the Cisadane River which forms a delta, while the eastern part is bordered by the Bekasi River and the Citarum River which also forms a delta. Based on the mud along the coast, the plains of the Jakarta Bay are estimated to be 5,000 years old. Rivers such as Ciliwung, Angke, Marunda, Cisadane, Bekasi and Citarum are located in the area that forms Jakarta Bay, which is a very attractive landscape for various uses such as industry, trading port and residential in various scales (LIPI, 2017).

Currently, the coast of Jakarta Bay has developed into a multifunctional area, namely as an area for tourism, fisheries, industry, trade, to an international port that has a high frequency of shipping transportation. This condition leads to the disposal of waste generated by the activities of all residents of Jakarta and its surroundings through the rivers that surround it. Three major rivers, namely the Angke River, Sunter River, and Ciliwung River have long been known as carriers of waste to Jakarta Bay (LIPI, 2017).

The development of the Jakarta Metropolitan Area during the last half century has triggered great pressure on the ecosystems in the waters of Jakarta Bay because they have to accept anthropogenic waste, both organic and inorganic in nature, through rivers and run-off from the mainland. Threats to the coastal water environment are increasingly triggering public concern because of the persistent, bioaccumulative and toxic nature of some pollutants (LIPI, 2017).

Inorganic waste from industrial activities has increased since 1980, especially lead (Pb) and copper (Cu). Compared to 20 years ago, the average concentration of Pb and Cu in Jakarta Bay sediments increased by 5 and 9 times, respectively. The concentrations of heavy metals measured in sediments such as Cd, Cu, Pb, Zn and Hg in the waters of Jakarta Bay in the east are generally lower than in the western Jakarta Bay. The spatial distribution of the highest concentrations of Pb and Cd in sediments was found in the western and central parts of Jakarta Bay (Arifin, 2004).

The Jakarta Bay area which is a place to live as well as a tourist destination, namely the Thousand Islands region which is a district that is the gateway to the DKI Jakarta Province has distinctive characteristics in

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terms of population and area with an area of 6,997.50 km2. The area covers 11 inhabited islands which are grouped into 2 sub-districts and 6 urban villages (DKI Jakarta Statistical Manager, 2021).

According to BPS data, the population of the Thousand Islands was 23,939 people in 2018. The workforce recorded the previous year was 9,959 people. There are 3,375 fishermen in the Thousand Islands. The majority of the population still relies on fishermen (jobs)." Although the majority of the population of the Thousand Islands make a living from fishermen.

There are many problems faced by fishermen today, the most important of which is the declining catch, this is related to the amount of household waste to inorganic waste that flows in Jakarta Bay. The waste that flows not only comes from local residents of the Thousand Islands, but 90% comes from the flow of 13 estuaries in JABODETABEK (Fakhi, 2021).

The economic dependence of residents is also largely dependent on tourists who come, this is because local residents work as traders and also homestay providers. For now, many residents have switched professions to become fishermen due to the COVID-19 pandemic which has reduced the number of tourists who come (UKT 1, 2021).

The application of the creative economy promoted by the local government to increase the skills of citizens, so that it can be an alternative in improving the economy of local residents, is considered slow to develop, due to the lack of citizen participation in participating in a series of empowerment and training. One of them is on the Island of Hope.

The island is adjacent to two other islands, namely Kelapa Island and Kelapa II, making these three islands more densely populated compared to other islands that are far apart. This island has good potential in developing business, especially the implementation of social entrepreneurship.

Based on these problems, it is necessary to follow up in the form of a business design, namely Plastic Fuel. Business is the result of implementing social entrepreneurship in the form of waste problems in Jakarta Bay. This design requires the design of various aspects that are needed. Therefore, the purpose of this research is to design a plastic fuel business by looking for the advantages of plastic fuel raw materials, the profit earned/year, the length of the payback period, and the determination of the selling price with the specified profit provisions.

II. LITERATURE REVIEW

Garbage is the residue of human daily activities and/or from natural processes in solid form (Suyoto, 2008). Garbage will continue to be produced and will never stop as long as humans exist. It is conceivable that the amount of waste produced by the inhabitants of this earth will increase. Garbage itself is a consequence of human activities and its volume is directly proportional to the population. If it is not handled effectively and efficiently, the existence of waste in nature will turn to destroy the life around it. Nature does have a big hand in automatic waste processing, especially organic waste. However, nature's hard work in decomposing waste naturally is very unbalanced compared to the millions of tons of volume of waste produced every day, the potential for municipal waste in several cities in Indonesia (PS Writer Team, 2008).

Plastic is a type of macromolecule that is formed by a polymerization process. Polymerization is the process of combining several simple molecules (monomers) through a chemical process into large molecules (macromolecules or polymers). Plastic is a polymer compound whose main constituent elements are carbon and hydrogen. To make plastic, one

The raw material that is often used is naphtha, which is a material produced from refining petroleum or natural gas. As an illustration, to make 1 kg of plastic requires 1.75 kg of petroleum to meet the needs of raw materials and the energy needs of the process (Kumar, Panda, & Singh, 2011).

Pyrolysis is the process of decomposition of a material at high temperatures in the absence of air or with limited air. The decomposition process in pyrolysis is also often referred to as devolatilization. The main products of pyrolysis that can be produced are charcoal (char), oil, and gas. The charcoal formed can be used as activated carbon, while the oil produced can be used as an additive or mixture in fuel, while the gas formed can be burned directly (Nurdianto, Nugraheni, & Ivana, 2016).

Social entrepreneurship itself is an effort to build a business starting from the motivation of solving community problems, by involving the community itself as business actors. The purpose of entrepreneurship itself is to make people empowered to meet their needs with their own abilities (Putri, 2017). According to Hulgard in palesangi, there are 4 main elements in social entrepreneurship, namely 1) social value creates benefits in society, 2) civil society (its activities involve initiatives and involve the community by optimizing existing capital), 3) innovation (generating creative business ideas in solving social problems), 4) economy activity (balancing between social and economic goals) (Palesangi, 2012). Of the four elements, in social entrepreneurship, there are empowerment activities, to make the community economically empowered, by

creating creative businesses by utilizing the capital owned by the community and involving them in managing the business.

According to Bygrave, 1994: 441 (in Buchari Alma, 2006: 198) defines a Business Plan as a document provided by an entrepreneur that contains details about the past, present and future trends of a company. According to Megginson (2000), a business plan is a written plan that contains a mini-business objective, workings and financial/capital details, the composition of the owners and management and how to achieve the business goals. From some of the definitions above, it can be concluded that a Business Plan is an important and very useful document for a business, which shows the current state and desired future.

Analyzing business feasibility can use the following formula (Soekartawi 1995).

$$R/C = \frac{Total\ Revenue}{Total\ Production\ Cost} \qquad ………...(1)$$

With the following criteria:
1. if R/C > 1 then the business is worth trying
2. if R/C < 1 then the business is not worth trying
3. if R/C = 1 then the business does not experience a loss or profit or in other words is at the break-even point

ROI analysis is an analytical technique commonly used by company leaders to measure the effectiveness of the company's overall operations. ROI itself is a form of profitability ratio which is intended to measure the company's ability with the overall funds invested in assets used for company operations to generate profits. Thus Return On Investment (ROI) relates the profits obtained from the company's operations with the amount of investment or assets used to generate operating profits (Munawir, 2004:89).

$$ROI = \frac{Profit}{Total\ Production\ Cost} \times 100\% \qquad ………(2)$$

Payback period is a period needed to cover investment expenditures that use cash flows (Rangkuti 2004).

$$PP = \frac{Investmen\ t\ Value}{Net\ Incoming\ Cash} \times 1\ year \qquad …......(3)$$

Assessment criteria: if the PP is shorter than the "maximum PP" then the investment proposal is acceptable.

Profit (π) is the difference between total revenue or total revenue (TR) and total cost or total cost (TC). If TR minus TC the result is positive, then a business can be considered profitable (>). On the other hand, if TR is reduced by TC, the result is negative, then a business can be considered detrimental (>0) (Harianto 2003).

$$\pi = TR – TC \qquad …......(4)$$

Note = π : Profit
TR : Total *Revenue*
TC : Total *Cost*

The break-even point is a condition that shows that the amount of income received by the company (total revenue) is equal to the total costs incurred by the company (total costs) (Siregar et al, 2013).

$$BEP\ (liter) = \frac{FixCost}{SellingPrice - VariableCost} \qquad …..(5)$$

$$BEP\ (Rp) = \frac{Fix\ Cost}{1 - (\frac{Variabel\ Cost}{Selling})} \qquad …..(6)$$

III.   RESEARCH METHOD

The data collection used in this study used the interview method with several local residents and regional officials on Harapan Island. The data obtained in the form of population, waste transportation system, and the amount of household waste transported per day to the Bantar Gebang TPA. In addition to conducting interviews, data collection was also carried out using the direct observation method, which obtained data from photos of garbage that came through the sea currents of the Thousand Islands. Data collection was also carried out using the literature study method. From the results of the literature study, there are theories that discuss aspects of feasibility studies in building a business. The sources and data are taken from several previous articles and journals that discuss the feasibility study of a business.

Data analysis was done by descriptive - qualitative method. Descriptive method is used to describe aspects of organization and management, to describe the existing condition of solid waste and its management. Furthermore, a qualitative analysis was carried out to take into account the feasibility study along with the cost aspects needed to build the Plastic Fuel business.

IV.   RESULT AND DISCUSSION

Organizational structure

The organizational structure of the Plastic Fuel business can be seen from the following chart:
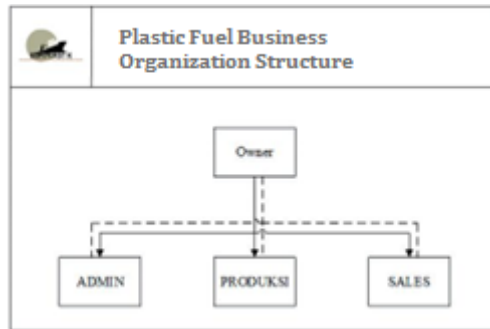

Figure 1. Business Organization Structure

The owner is responsible for all parts related to the Plastic Fuel business. the admin is responsible for receiving plastic waste to collecting data on product purchases.

In the Plastic Fuel Business, there are 2 production people who are responsible for the entire production process in the Plastic BBM business, and have one sales person who is responsible for product sales in the Plastic BBM business.

• Business Concept

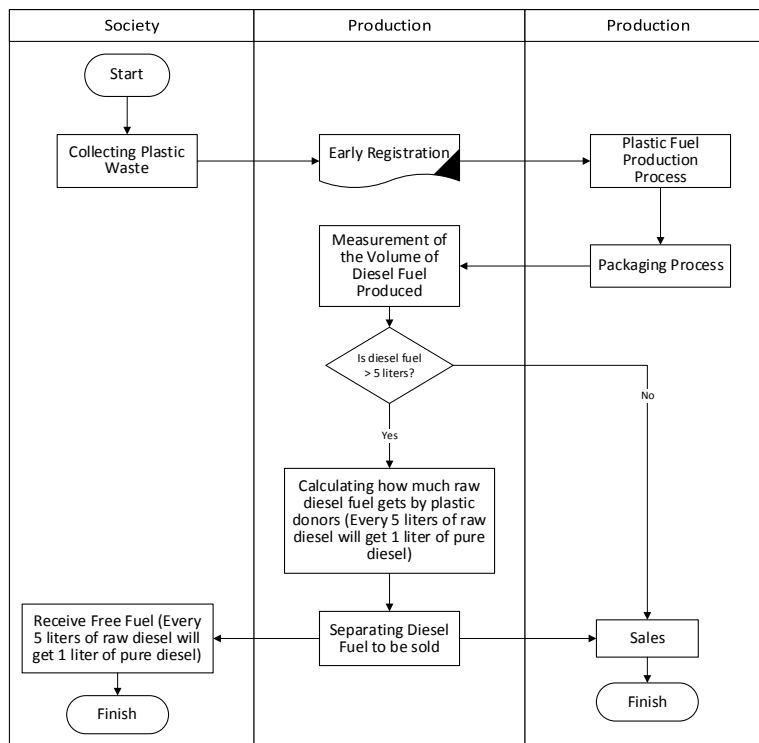The business concept can be seen from the flowchart below:

Figure 2. Sales Concept Flowchart

Market and Marketing Aspects
Location
The determination of the location of the Plastic Fuel business is on Harapan Island, the determination of this place is based on the results of an observation survey, and it was found that Harapan Island is the closest location to Kelapa Island and Kelapa II Island, so that when combined this location is the location with the highest population density.

• Type of product marketed
The types of products marketed are fuel oil products, namely diesel and gasoline in the Naphtha category, whose contents are made of plastic with fewer emissions due to having a higher octane number than gasoline in general.

Table 1. Comparison of Octane Numbers

Comparison of Octane Numbers			
Category	Compound Element	Octane Number	Contents
(*Gasoline*)	C_5-C_{10}	40-95	Crude oil
Nafta	C_6-C_{10}	70-100	Plastic/Synthetic rubber

(Source : Ionkovalen,2020)

•*Competitor*
For now, competitors in this business are the biggest suppliers of fuel, namely PT Pertamina.

• *Target Buyers*
The main target buyers at this time are fishermen who need diesel fuel to move their boats this is because 60% of the population on Harapan Island work as fishermen. However, the use of solar can also be from the age group > 15 years.

• *Promotion*
The promotion that we implement is through millennials in the strategy to drive love for the environment, this can make them realize how important it is to protect the environment so that they can contribute to the collection of plastic waste. Not only that, for our own use, we will open a stand outlet near the pier, so that sales and product explanations can be conveyed directly to the main target, namely fishermen.

• *Market Development*
The market development in this business is the expansion of outlets/places on various other inhabited islands, especially in the Thousand Islands.

• *Marketing Steps*
Initially, a discount will be opened to attract diesel buyers, and to increase community cooperation in providing plastic waste, an attractive offer will be given, namely to get key chain merchandise made from the residue left in the diesel manufacturing process.

Production Aspect
• **Product Description**
The product is naphtha diesel fuel. Usually used as fuel for vehicles and so on. The quality of this plastic fuel is one of the best quality diesel fuel, because it has a high octane number so that the combustion emissions produced are also small. The smell of this product is not overpowering so this is one of the other advantages of this product.

Figure 3. Solar Naphtha

• *Product Composition*

The composition of the Plastic BBM product only consists of 100% plastic without the addition of other components, so the ratio of plastic and diesel produced is 1:1 or 1 kg of plastic is equal to 1 liter of diesel.

•*Making process*

The process of making this type of naphtha diesel is called the pyrolysis process. The manufacturing process in producing diesel is plastic which is collected at least 5 kg. Then wash the plastic and then dry it, After that, sort the plastic based on the type of color, this can separate the type of diesel produced based on the type of octane. Put the plastic into the chopper/cutting machine. After that, put the plastic into the Pyrolysis machine, the machine will warm up to 400oC without oxygen. Wait for about 15 minutes, and the diesel will come out of the filtration tube (Jatmiko et al, 2018)
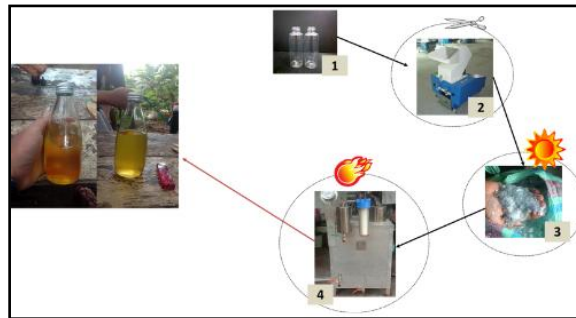

Figure 4. Schematic of the Product Manufacturing Process

• **Packaging Process**

After the diesel has come out of the filtration tube, the solar packaging process is also manual by pouring the diesel collected in the filtration tube and then putting the diesel fuel into a glass bottle, this is to maintain the quality of the diesel. After that, label the glass bottle.

Cost Aspect

• *Investment Cost*

The total investment cost incurred per year is Rp.24,690,000,- with a residual value of 60% of the total price, and the total depreciation cost is Rp.1,356,400,-.

Table 2. Investment Cost

No	Investment Cost Component	Component Specification	Total	Unit	Price/Unit(Rp)	Total Price (Rp)	Duration (Th)	Depreciation
			Total Investment Cost/ Year					
1	Plastic Waste Changing Machine	Prolisis	2	unit	Rp6,000,000	Rp12,000,000	12	Rp700,000
2	Plastic Crushing Machine	Cutting machine	2	unit	Rp3,000,000	Rp6,000,000	12	Rp350,000
3	Garbage Sorter	-	2	unit	Rp30,000	Rp60,000	10	Rp4,200
4	Petrol Drum 200 lt	-	2	unit	Rp100,000	Rp200,000	10	Rp14,000
5	Residual Cans	-	2	unit	Rp20,000	Rp40,000	10	Rp2,800
6	Gunny sack	-	3	unit	Rp10,000	Rp30,000	10	Rp2,400
7	Big Scales	-	2	unit	Rp100,000	Rp200,000	10	Rp14,000
8	5 liter jerry can	-	5	unit	Rp25,000	Rp125,000	10	Rp11,000
9	Oil Funnel	-	5	unit	Rp10,000	Rp50,000	-	-
10	Rubber gloves	-	4	unit	Rp15,000	Rp60,000	-	-
11	Table	Olympic	3	unit	Rp100,000	Rp300,000	10	Rp24,000
12	Laptop	HP	1	unit	Rp5,000,000	Rp5,000,000	10	Rp200,000
13	Chair	Olympic	3	unit	Rp75,000	Rp225,000	10	Rp18,000
14	Printer	HP	1	unit	Rp400,000	Rp400,000		Rp16,000
	Total					Rp24,690,000		Rp1,356,400

(Source: Calculation Results)

• *Raw Material Cost*

The main raw material for making products is plastic waste, because plastic waste is obtained for free, therefore the raw materials prepared are packaging, namely 1 liter glass bottles and label stickers for Rp. 43.200.000,-/year.

Table 3. Cost of Raw Materials

Raw material	Number of units	Unit	Price	Material Specification	Total
		Raw Material Cost			
1 liter Glass Bottle	43,200	Unit	Rp800	Kaca	Rp34,560,000
Profit Sticker	43,200	Unit	Rp200	Kertas	Rp8,640,000
		Total per Year			Rp43,200,000

(Source: Calculation Results)

• *Payroll Fees*

The Plastic Fuel Business has 5 employees with different salaries for each position, the determination of the basic salary for Plastic BBM employees is based on the set working hours, which is 10.00 WIB - 16.00 WIB, this is because it takes time to collect plastic waste which is the main raw material. in the manufacture of plastic fuel products and obtained a total of Rp. 126,000,000, -/year.

Table 4. Payroll Costs

Position	Number of person	Basic Salary	Meal allowance	Total
		Payroll Fee		
Owner	1	Rp2,200,000	Rp300,000	Rp30,000,000
Admin	1	Rp1,700,000	Rp300,000	Rp24,000,000
Production	2	Rp1,700,000	Rp300,000	Rp48,000,000
Sales	1	Rp1,700,000	Rp300,000	Rp24,000,000
	Total per Tahun			Rp126,000,000

(Source: Calculation Results)

•*Operating costs*
The monthly operational costs that must be spent are IDR 30,400,000 / year with details of water costs, machine maintenance costs, space rental, and electricity costs.

Table 5. Operational Costs

No	Component	Specification	Unit	Unit Price/ Month	Total Price
		Raw Material Cost			
1	Water Fee	1	m3	Rp30,000	Rp360,000
2	Machine Maintenance Cost/Year	2	unit	Rp500,000	Rp1,000,000
3	Place Rental Fee	1	unit	Rp800,000	Rp9,600,000
4	Electricity cost	32.5	Kwh	Rp50,000	Rp19,500,000
	Total per Tahun				Rp30,460,000

(Source: Calculation Results)

The next step is the calculation of HPP costs and the determination of the selling price is obtained as follows:
Fixed Cost = Depreciation Cost + Overhead Cost
Fixed Cost = Rp. 1.356.400+Rp. 30,400,000
Fixed Cost = Rp. 31,756,400,-/year.

$$HPP = \frac{Fix\ Cost\ + Operating\ Cost}{Total\ Production\ x\ Workdays\ 1\ year}$$

$$HPP = \frac{Rp.31.756.400 + Rp.30.400.000}{100\ x\ 360}$$
HPP = Rp.2.859,-

Selling Price = HPP + (HPP x Profit%)
Selling Price = Rp. 2.859 + (Rp. 2.859 x 100%)
Selling Price = Rp. 5718 or Rp.6000/liter

The selling price of plastic fuel products was obtained at Rp. 6000/liter with a profit setting of 100%.

3. **Economic Analysis**

R/C analysis

Total Production Cost = Production Cost + Overhead Cost

Total Production Cost = Rp.62.156.400/ year

Total income 43200L = HPP x Total Production

Total income / year = Rp. 259.200.000

Total income /month = Rp. 21.600.000

R/C = Total Income : Total Production Cost R/C = Rp.259.200.000 : Rp.62.156.400 = 4,17

So the plastic fuel business is profitable because the R/C value is > 1

ROI analysis

Based on the results of the return on investment, the overall rate of return on investment in the business being run is 81.40%.

$$ROI = \frac{Profit}{Total\ Production\ Cost} \times 100\%$$

$$ROI = \frac{Rp.53.043.600}{Rp.65.156.400} \times 100\% = 81,40\%$$

Payback Period analysis

Based on the results of the financial analysis above, the business capital or investment costs incurred to establish this business will return within 0.09 years, with a total production of 43200 liters per year from 360 working days per year.

$$PP = \frac{Rp.24.690.000}{Rp.259.200.000} \times 1\ year = 0,09\ year$$

Profit analysis

Profit analysis in sales of 100 liters / day, because the Plastic Fuel business applies the concept of giving > 5 kg of plastic, you will get 1 liter of free diesel, so if the production per day is 100 liters, the remaining 20 liters is a free product to reward contributors of > 5 kg of plastic.

$\pi = TR - TC$

$\pi = $ Rp. 216.000.000 – Rp. 201.016.400

$\quad \pi = $ Rp. 14.983.600,-/year.

BEP analysis

It was found that the Plastic Fuel business had to produce as much as 24474 Liters to reach the Break event point, while for sales it was Rp. 146.844,923 to reach the break even point.

$$BEP\ (Liter) = \frac{Rp.31.816.400}{Rp.\ 216.000.000 - Rp.169.200.000}$$

BEP (Liter)　　　= 24474 Liter

$$BEP\ (Rp) = \frac{Rp.31.816.400}{1 - (\frac{Rp.169.200.000}{36000})}$$

BEP (Rp)　　　= Rp. 146.844.923,-/year.

V.　CONCLUSION

The Plastic Fuel Business can be the best alternative solution in choosing environmentally friendly fuels, because the emissions produced are less than diesel in general and can also reduce the capacity of transporting waste from Harapan Island to the Bantar Gebang TPA.

The determination of the selling price of Plastic Fuel at Rp. 6000,-/liter, the price is the cheapest diesel fuel compared to diesel that is sold in general and the price is included with a profit of 100%.

The calculation of the profit obtained by the Plastic Fuel business is Rp. 14,983,600,-/year to produce 100 liters of diesel per day.

The return on capital in the Plastic Fuel business has yielded a yield of 0.09 years, so this business has the potential to quickly pay off capital in less than one year.

Acknowledgements

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