Conference Paper

Added Value Plastic Waste Recycling Post-pandemic as a Circular Economy in Indonesia

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Abstract.

Employee performance is crucial in assessing one's capacity to compete in the workplace. Good performers will be able to help the business achieve its objectives. This investigation on employee performance takes the shape of a proposed study. This study aims to determine the effect of recruitment, training, and motivation on employee performance. Companies must be able to implement sound strategies and make changes to HR management because business conditions are constantly changing. The fulfillment of HR through recruitment will greatly determine the development of an organization because HR is the most important source of capital. In conducting recruitment, you must look for human resources with competencies that match the company needs. Furthermore, the company must have a clear and measurable training program so that the HR recruited are able to complete all their work properly. Moreover, the role of motivation also determines a person's work as expected by the company. Many previous studies have stated that there is a link between recruitment, training, and motivation on employee performance. The results are still in the form of a proposal study; for more details whether there is an effect of each variable, it is necessary to analyze research data.

Keywords: recruitment, training, motivation, employee performance

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1. Introduction

According statistical data of Sistem Informasi Pengelolaan Sampah Nasional (SIPSN) in Indonesia, plastic waste ranks in 2nd largest after culinary organic waste. Because plastic has become one of the most commonly used materials in our daily lives and by 2021, Indonesia will produce 25.95 million tons or 15.96% of the total waste generated [1]. This is one of the problems as well as challenges that must be handled seriously by the government through regulations to be able to manage this plastic waste properly, so as to minimize the impact of environmental pollution on land, water and air [2].

Along with technological developments, the demand for plastic continues to increase, plastic is an artificial inorganic material composed of chemicals that are difficult to decompose so that it is harmful to the environment [3]. Therefore, by processing plastic

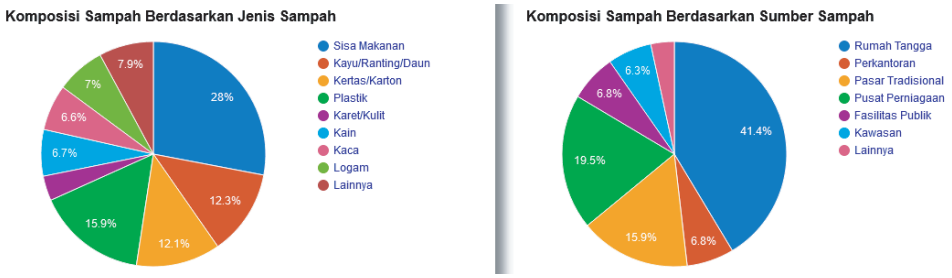

Figure 1: Waste composite graphic [1].

waste into plastic seeds that can be reused as production raw materials. This action will reduce environmental pollution, because the economy will continue to flow as long as there is a turnover value [4]. Utilization of plastic waste into plastic pellets is a good enough solution to significantly reduce the population of plastic waste in society while providing added economic value [5]. Hidayat argues that raw materials from recycled plastic seeds can be made into various products such as household appliances, furniture, toy products, non-food packaging, polybags, sacks, electronic products and others. Based on previous research conducted by Takenaka [6] has divided the proportion of plastic recycling management activities as shown in Figure 2 below.

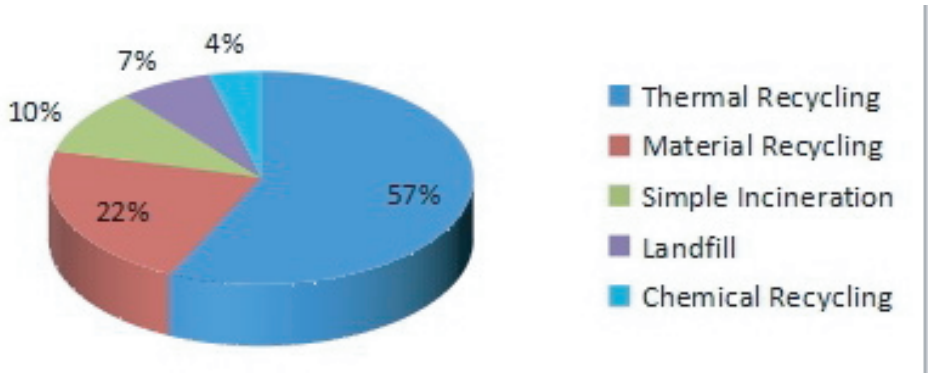

Figure 2: Treatment and disposal methods for waste plastic [6].

The development of technology that presents a practical life, triggers an increase in the use of plastic in human life. It is caused flexible, lightweight, practical and can replace the packaging function of other goods. This practical and economical nature causes plastics to be often used as disposable items, so that the more use of equipment made of plastic materials, causing more and more plastic waste. This is what causes the amount of plastic waste to increase continuously and causes serious environmental problems [7]. One of the factors that cause damage to the environment which is still a problem until now is the plastic waste disposal factor. It should be noted that plastic waste that has polluted the soil takes tens or even hundreds of years to completely

decompose naturally. In addition, the negative impact of plastic waste if left alone will cause a very big danger [8]. Based on the increasing level of public awareness of the dangers of environmental pollution from plastic waste for the sake of survival in the future, the use of plastic waste has been widely carried out from converting plastic waste into handicraft products that have economic value to processing recycled plastic waste into plastic seeds again. No many peoples have awareness about waste of plastic, even though this activity has a progressive economic added value in accordance with its production capacity [9].

Meanwhile, the government through the ministry of industry stated that it would continue to encourage the implementation of a circular economy (CE) through the application of the Guidelines for the Production Procedures for recycled plastic for food packaging, and National Standards. In addition, taking the initiative to implement regulations on the Recycling Component Level for finished plastic goods to be used in the procurement of goods and services by the government and providing incentives for reducing VAT for the plastic recycling industry. These efforts are expected to encourage the creation of a CE concept in plastic products based on the principle of reuse to maximize the economic value of leftover consumption goods. The implementation of a CE needs availability of resources to be utilized through using of materials that continue to rotate in an economic circle so that they can be used continuously. This industrial sector processes single-use packaging scraps and other plastic items into value-added products, from recycled resins to finished products such as plastics, textiles and pallets. The population of the plastic recycling industry in Indonesia is around 600 large industries and 700 small industries with an investment value of IDR 7.15 trillion and a production capacity of 2.3 million tons per year with added value of more than IDR 10 trillion per year [10]. However, this is still around 9% of the amount of plastic waste produced in a year.

Operational costs (OC) in the process of CE from recycled plastic to plastic pellets as production raw materials are a research problem. This is because the cost of processing plastic waste can be inefficient or more expensive than the selling price in the form of plastic chips/regrind to become plastic seeds [4]. To raise awareness of the environment for plastic waste pollution, it is necessary to be convinced through theoretical calculations that the management of plastic waste still has a high economic value. Based on the background above, the problems in this study can be found as follows:

1. Does plastic waste affect the circular economy?

2. Does plastic recycling affect circular economy?

3. Does the added value of recycling plastic waste affect the circular economy?

4. Whether government assistance can strengthen the influence of plastic waste, plastic recycling and added value of recycling plastic waste on circular economy?

2. Literature Review

Cost is a very important element at every stage of the process in the management of plastic recycling waste processing. The results of previous research conducted by Hidayat et al [5] explained that the most effective plastic waste management is recycling. This concept is in line with the circular economy system that places the handling of plastic waste downstream, thereby enabling the creation of an interconnected cycle between plastic waste and recycled plastic. The circular economy is not just recycling, it includes the supply chain and many sectors, reprocessing design, manufacturing and consumption so as to open up new untapped markets. This system is very different from the linear economic system that has been implemented so far. Linear economy states that plastic will end up as waste after it loses its use/economic value.

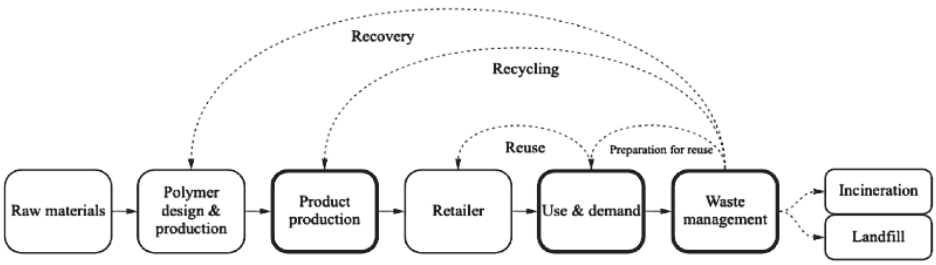

Figure 3: Flow process plastic value chain [11].

Wahab [12] said that total operating costs are the sum of direct costs and indirect costs. So, this is greatly influenced by the efficiency and effectiveness of the process line and the work of employees. Another researcher [13] argues that, the relationship between cost efficiency and time effectiveness is a measure of operational cost efficiency. Evaluation of operational cost optimization can use the Earned Value Method which is formulated as follows:

Yield Value = (% completion) x (budget) (1)

Processing plastic waste into plastic pellets, it can be done in a batching process, meaning that it is separated based on a lot of incoming waste. The batching process can also be based on the type of plastic material/waste because all types of plastic

waste have different price values, Przywara [14] argues through his thesis that, it can be explained in Figure 3 below:

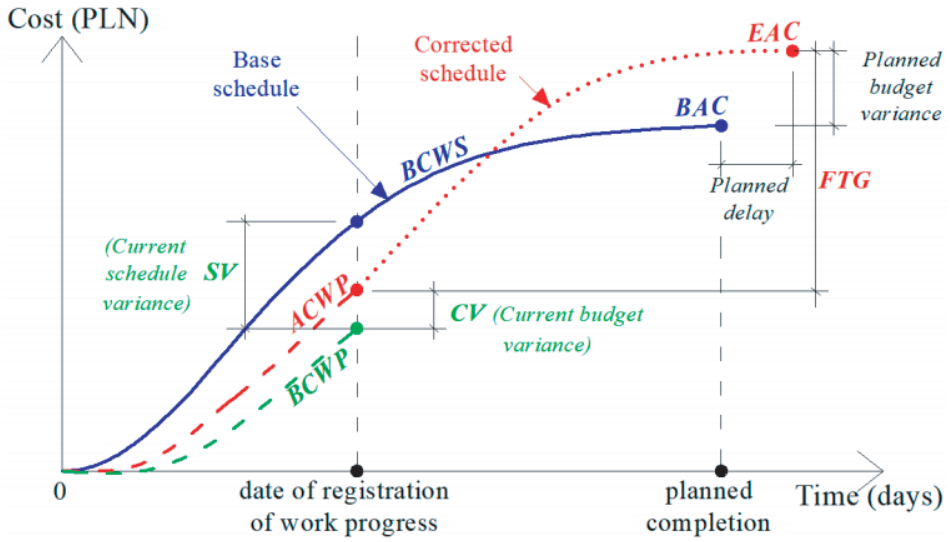

Figure 4: Element earned value method [14].

The graph above explains that to measure operational costs, estimated process costs can be calculated through the following three elements:

1. Budget Cost for Work Schedule (BCWS) is a budget that is prepared based on a work plan against time. BCWS on project completion is called Budget at Completion (BAC). BCWS is a cost budget/batching process.
2. Budget Cost for Work Performed (BCWP) is the cost value received/batching process. This number of BCWP is called the Earned Value, which is calculated based on the accumulated batching processes that have been completed.
3. Actual Cost for Work Performed (ACWP) is the actual cost of the work that has been carried out.

Obtained from accounting data at the reporting date, namely records of all actual expenses incurred from a number of batching processes that have been carried out. Based on the types of costs described above, operational cost performance evaluation material can be seen from:

1. Cost Variance (CV) which is calculated based on the difference in the value of the cost/batching process that has been completed with the actual operational costs. If the CV is positive, it indicates that the cost/batching value is greater than the actual costs incurred and vice versa.

CV = BCWP – ACWP

CV = 0 : costs according to the planned budget

CV > 0: lower/efficient costs

CV < 0: more cost / extravagant

1. Schedule Variance (SV) is a deviation between BCWP and BCWS. If the value is positive, it indicates that the batching process has completed more than planned. Conversely, if the value is negative, it indicates that the performance of the batching process is poor because it is less than the planned schedule.

SV = BCWP – BCWS (2)

SV = 0 : project on time

SV > 0 : projects faster

SV < 0 : project is late

1. The Cost Performance Index (CPI) is an operational performance index based on costs, by comparing the value of the completed batching process costs (BCWS) to the actual costs in the same period (ACWP).

CPI = BCWP/ACWP

CPI = 1 : costs according to the planned budget

CPI > 1: lower/efficient costs

CPI < 1: costs more/wasteful

1. Schedule Performance Index (SPI) is a performance efficiency/batching process that has been completed (BCWP) for planned expenses based on the batching process plan (BCWS).

SPI = BCWP/BCWS

SPI = 1 : production on time

SPI > 1 : faster production

SPI < 1 : late production

Cost of Final Process Completion/Estimate at Completion (EAC) is a very important cost calculation component obtained from calculating CP and SPI is to statistically predict the cost required to complete the batching process. There are several EAC calculation formulas, one of which is as follows:

$$EAC = ACWP + \frac{(BAC - BCWP)}{CPI\ x\ SPI} (3)$$

Based on Estimate at Completion (EAC) or *variance at completion* (VAC).

$$VAC = BAC -- EAC(4)$$

VAC is the basis for assessing process status in terms of cost and time, which is considered efficient/not.

Based on an understanding of the importance of processing plastic waste which not only has the potential for high economic added value, but also reduces environmental pollution. Operational efficiency in managing plastic waste is important in maximizing economic value in the process chain cycle. The complexity of the analysis of the supply chain cycle of the plastic waste recycling processing process takes into account cost efficiency to obtain optimal economic added value so as to produce competitive plastic pellet output prices. The Covid-19 pandemic situation has created many new business opportunities [15]. This condition triggers the growth of new industries on a small scale and makes business competition more stringent. The selling price is the main consideration amidst the weakening economy and people's purchasing power.

Therefore, operational cost efficiency is very important to note in ensuring business continuity. With direct visits to see the flow of business processes and active discussions with business actors, it is hoped that the community service research team can contribute scientifically academically in the management of financial management related to operational costs. On the other hand, the team will also gain direct experience from business actors so that researchers can find gaps between business practices and entrepreneurial theory.

3. Research Methodology

This research was conducted from March to September 2022. Collection primary data technic will be obtained through online questionnaires, while the secondary data will be collected from the literature, journals, and research reports relevant to the study material. This study uses purposive sampling with total population 215 respondents from 2 companies. Technical sampling is using Slovin formulation then get sample 140 respondents in CV. Era Jaya and UD. Kaitosen Chemplast. The respondents were taken from a list of workers who works in those companies and supplier of plastic waste collector. This research focuses on raising public awareness and convincing them that plastic waste still has high economic added value if managed properly. Therefore, this research begins with the analysis of plastic waste recycling product with the concept circular economic. Descriptive analysis and Structural Equation Modelling Partial Least

Square (SEM-PLS) will use in the analysis. SEM PLS Descriptive analysis will use to describe the respondent characteristics while using determine to test the hypothesis on variables affect raising awareness of plastic waste to do recycling process.

This research is an associative research which aims to analyze and find out the relationship between two or more variables. In addition, this study will test theories or hypotheses with a statistical approach to measure linearly and explain causal relationships between variables, where hypotheses are formulated to produce a statement whether it is ”accepted” or ”rejected”.

The population is the entire object to be studied, while the sample is part of the population. The sampling technique in this study used purposive sampling / sampling with criteria. The criteria include; business actors registered with the Indonesian Plastic Recycling Association (ADUPI). The total population of plastic waste collectors and recycling business actors is 500 business units. Within the framework of the plastic recycling process, it is relatively the same, therefore in this study, researchers took samples from 2 plastic recycling business actors in the beautiful coast of Dadap Tangerang, which are quite large with a production capacity of 250 - 300 tons/month each and absorbed a total of employees in both places of business reached 200 employees. Then data collection through direct questionnaires to employees and business actors.

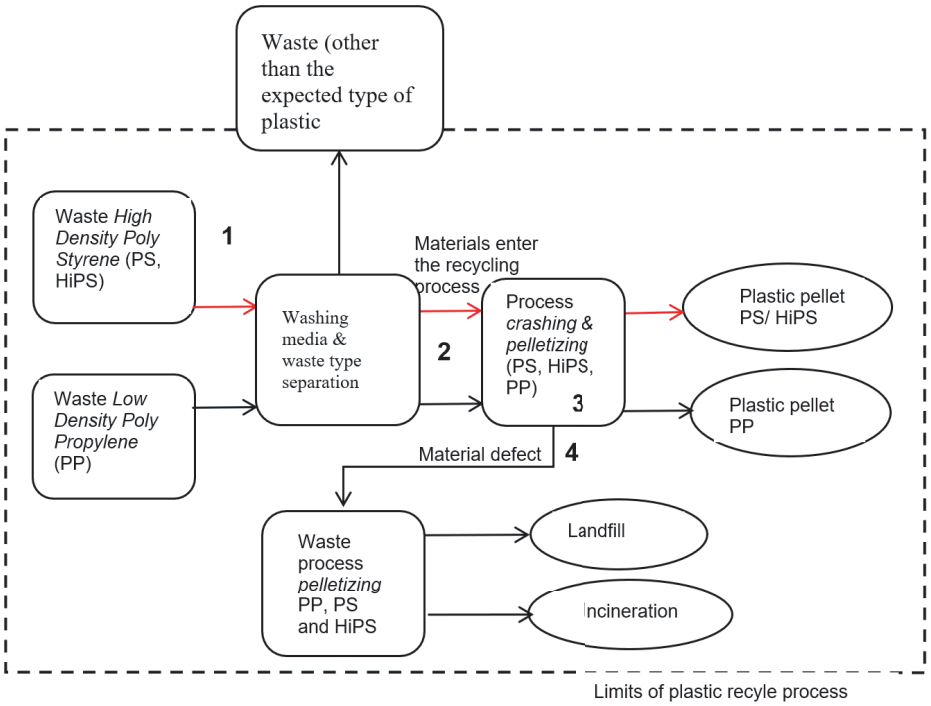

Figure 5: Flow process research.

4. Discussion

Based on the results of the process analysis of separating the types of plastic waste from low-density to high-density plastic, it can be explained as follows:

1. The process separating the types of plastic waste that are classified as low density (PP) and high density (PS/HiPS) needs to be separated because these two types of plastic cannot be combined if they are mixed into plastic pellets (in the form of pellet material). If this happens, the result is that when it is processed/printed into a product it will break. This is caused by differences in the chemical bonding of different hydrocarbon compounds between these two types of plastic materials. As for distinguishing the type of plastic referred to as a water medium, plastic classified as low density will float on the surface of the water, and those classified as high density will sink in the water. The separation, washing, and crashing processes to produce plastic chips are carried out by workers from around the Dadap Tangerang area using a wholesale system calculated per kilogram. The cost calculation for this process is IDR 1000/kg, the same for the two types of plastic. The price for plastic waste that has not gone through the crashing process is Rp. 4000,-/kg up to Rp. 8000,-/kg, while the waste that has become plastic chips costs Rp. 5500,-/kg up to Rp. 11,000,-/kg depending on the quality of the waste, measured by the variance of contamination of the plastic waste. The purer and cleaner the waste is, the more expensive it is, and vice versa.
2. The next process is the packing process after it becomes a plastic chip and delivery to the temporary storage warehouse to wait for the pelletizing process production schedule.
3. When the pelletizing production schedule arrives, the plastic chips which have been separated according to their type are taken from the storage warehouse and put into the extruder machine hooper in stages. The cost calculation for the production of plastic pellets for PP chip material is Rp. 2200,-/kg, where the price of HiPS chip material is Rp. 2000,-/kg, so that the total process cost is IDR 3,000/kg up to IDR. 3200,-/kg with 2% allowance loss. The selling price of plastic pellets in the form of pellets is divided into several variants, from Rp. 10,500 to Rp. 17,500, - with a production capacity of 8 to 10 tons/day.
4. The objections of the plastic recycling (pelletizing) process so far carried out by business actors are being sold for the process of confining vacant land or burning it.

After carrying out activities through various operational management discussions based on process analysis and application of theoretical applications, operational cost measurements can be calculated as follows:

1. Based on the analysis of the recycling process above, there are 2 process steps, namely the first is the process of separating plastic waste according to its type by directly crashing it into plastic chips, the second is the process of pelletizing plastic pellets. So that the calculation of the Cost for Work Schedule (BCWS) or the cost/batching process, the first batch is Rp. 1000, -/kg, the second batch is Rp. 2000, - up to Rp. 2200,-/kg. So that the total process cost is Rp. 3000,-/kg up to Rp. 3200,-/kg. So that the evaluation of operational cost performance is obtained:

2. CV_{PP} = BCWP – ACWP

= 3200 - 3150

= Rp 50,-/kg

CV_{HiPS} = BCWP – ACWP

= 3000 - 2970

= Rp 30,-/kg

CV > 0 : lower cost

1. Based on monitoring of daily production results, Schedule Variance (SV) daily output does not occur deviation between BCWP and BCWS. Thus, SV = BCWP – BCWS = 0, meaning that production is on time.

2. Cost Performance Index (CPI_{PP}) = BCWP/ACWP

= 3200/3150

= 1,016

(CPI_{HiPS}) = 3000/2970

= 1,010.

So that can be interpreted CPI> 1: lower cost/efficient. Schedule Performance Index (SPI) = BCWP/BCWS = 1, meaning the project is on time. The Cost of Final Process Completion/Estimate at Completion (EAC) is calculated as follows:

$$EAC = ACWP + \frac{(BAC - BCWP)}{CPI\ x\ SPI}$$

$$EAC_{PP} = 3150 + \frac{(3264 - 3200)}{1,016\ x\ 1,010}$$

$$= Rp\ 3212,37,-/kg$$

$$EAC_{PP} = 2970 + \frac{(3060-3000)}{1,016\ x\ 1,010}$$

$$= Rp\ 3028,47,-/kg$$

Work performance that has been achieved (EAC) or so-called variance at completion (VAC).

$$VAC = BAC - - EAC$$

$VAC_{PP} = 3264 - 3212,37 = Rp\,51,63,-/kg$ $VAC_{HiPS} = 3060 - 3028,47 = Rp\,31,53,-/$

VAC is positive, meaning that the evaluation of process status in terms of cost and time is considered efficient.

5. Conclusions and Recommendations

The research conducted at CV Era Jaya, which is located in the sub-district of Pantai Indah Dadap, Tangerang, is considered to be quite efficient in carrying out the company's operational management. The research is filled with discussions and sharing experiences (knowledge sharing) as well as operational management theory, business people feel they have certainty to calculate in a measurable way their business activities, where so far only using business feeling trial and error has become business experience. Likewise for researchers, we get a lot of experience in business practice which is full of dynamics and complexity of problems in the field.

By calculating measurable cost efficiency, business actors can determine when it is time to increase capacity and expand their business.

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