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Evaluation of Green Productivity Implementation for Measuring Environmental Performance in The Dakron Pillow Production Process at Cv. Jesselyne

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Abstract

This study aims to evaluate the application of the Green Productivity concept in the production process of dacron pillows at CV. Jesselyne. Green Productivity is an approach that integrates increased productivity with reduced environmental impacts, in order to achieve industrial sustainability. The methods used include Material Balance analysis to measure the efficiency of raw material utilization and the level of waste generated, as well as the calculation of the Benefit-Cost Ratio (BCR) to assess the economic feasibility of implementing the strategy. The results of the study indicate that the application of Green Productivity is able to increase the efficiency of the production process and reduce waste significantly. The BCR value obtained is 1.52, indicating that each investment made provides economic benefits that exceed its costs, making it feasible to implement. Thus, the application of Green Productivity is proven to be effective as a strategy to improve environmental performance while strengthening the economic aspects of the industrial production process.

1. INTRODUCTION

Increasing productivity is crucial for maintaining a company's sustainability and competitiveness. However, productivity alone is no longer sufficient without attention to environmental sustainability(Anwar and Indriana 2014). As demands for environmentally friendly industrial practices increase, many companies are beginning to adopt approaches that integrate production efficiency and environmental responsibility, one of which is the concept of Green Productivity (GP)(Pradana, Leksono, and Andesta 2018). This concept offers a synergy between increased productivity and reduced environmental impact to achieve sustainable industry(Mubin and Zainuri 2012).

Green Productivity is a method that combines environmental management and increased industrial efficiency through approaches such as energy efficiency, waste reduction, and optimization of raw material use(Azis 2023).One approach used in implementing Green Productivity is Material Balance, which measures the balance between inputs and outputs in the production process and identifies potential(Moses Laksono Singgih and Kariana

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2008).Furthermore, to ensure the economic feasibility of a Green Productivity strategy, the Benefit-Cost Ratio (BCR) method is used. This method assesses the comparison between the benefits and costs of implementing changes or investments in the production process(Farahdiansari and Anggraeni 2023).

CV. Jesselyne is a manufacturing company specializing in the production of Dacron pillows. During its production process, the company generates waste in the form of scrap fabric, Dacron, thread, plastic, and other packaging materials(Jesselyne 2024). Therefore, an approach is needed that can simultaneously increase process efficiency and reduce environmental impact. The implementation of Green Productivity through Material Balance evaluation and BCR calculations is expected to be a solution to improve the efficiency of material and energy use, as well as strengthen the company's sustainability aspects(Moses L Singgih 2018).

productivity concept to the dacron pillow production process at CV. Jesselyne, analyze the material balance as a tool to measure production efficiency, and assess the economic feasibility of this application using the Benefit-Cost Ratio approach. The results of this study are expected to provide a tangible contribution to supporting sustainable production in the small to medium-scale manufacturing industry sector.

2. METHODS

This research is a case study with a quantitative descriptive approach conducted at CV. Jesselyne, a manufacturing company engaged in the production of Dacron pillows. The study aims to evaluate the implementation of the Green Productivity concept with a focus on material efficiency and the economic feasibility of sustainable production processes. The study was conducted at CV. Jesselyne's production site located at Jl. Dukuh Kupang Timur XV No. 30, Surabaya, East Java. Data collection activities were carried out from February to May 2025.

1. **Data collection technique**
   Data collection methods include:
   a) Direct observationto all stages of the production process, from cutting raw materials to product packaging.
   b) Interviewlogistics staff to gain in-depth information on process efficiency and waste management policies.
   c) Documentationin the form of collecting records of raw material usage, number of finished products, waste volume, and details of costs and income.

2. Research Variables
   This study examines four main groups of variables:
   a) *Input***:**Dacron, polyester fabric, zippers, thread, plastic packaging, electricity, and labor.
   b) *Output*: Number of Dacron pillows produced and production waste.
   c) Green Productivity Variable: Efficient use of materials, waste reduction, and changes in production processes that support the environment.
   d) Economic variables: Total production costs and economic benefits obtained, including from product sales and waste generation.

3. **Data Analysis Techniques**
   Data analysis is carried out in two main stages:
   a) Material Balance Analysis

Used to evaluate the balance between material input and output at each stage of production. Formulasbasis used:

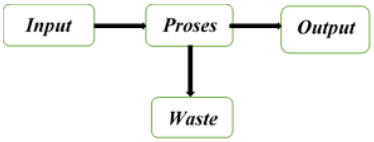

Figure 2.1Material Balance Formula

This analysis was conducted for each process: fabric cutting, initial sewing, dacron filling, final sewing, vacuum packing, and packaging. The goal was to identify production stages with the highest waste and potential for material efficiency improvements(Ermawati and Wiyono 2022).

b) **Benefit-Cost Ratio (BCR)**

Used to evaluate the economic feasibility of implementing a Green Productivity strategy(Sururi and Agustapraja 2020). The BCR formula used is:

Benefit Cost Ratio Formula

$$BCR = \frac{\text{PV [Benefit]}}{\text{PV [Cost]}}$$

Where:

1. Benefitsincludes income from product sales as well as the economic value from waste utilization (cloth, dacron, plastic).
2. Costincludes the costs of raw materials, labor, electricity, machine maintenance, and waste management.

If the BCR value is > 1, the project is considered economically feasible. All calculations were performed using Microsoft Excel to ensure accuracy in quantitative calculations.

3. RESULTS AND DISCUSSION

A. Material Balance Analysis

A Material Balance Analysis was conducted to determine the efficiency of raw material use and the amount of waste generated in the Dacron pillow production process at CV. Jesselyne. The production process consists of six stages: fabric cutting, initial sewing, Dacron filling, final sewing, vacuum packing, and packaging.

Table 4.1Material Balance Analysis

No	Production Stages	Input	Output (Product)	Waste
1	Fabric Cutting	4 rolls of cloth (149.76 kg)	3000 sheets (114.08 kg)	35.68 kg of fabric scraps
2	Initial Sewing	114.08 kg fabric, 20 kg rope, 12 kg seams	3000 pillowcases (114.08 kg)	1.52 kg of remaining rope, 2.1 kg of remaining pleats
3	Dacron Filling	114.08 kg pillowcases, 2600 kg dacron	3000 dacron filled pillows (2400 kg)	200 kg of coagulated dacron
4	Final Stitching	8 rolls of thread (4 kg)	Perfectly covered pillow	0.5 kg of leftover yarn
5	Vacuum Packing	25 kg vacuum plastic	3000 vacuum-packed pillows	2.5 kg of plastic waste
6	Packaging	30 kg plastic labels, 10 kg straps	3000 pillows ready for sale	0.5 kg plastic & 0.5 kg rope

From a total input of 3,078.92 kg, the finished product output was 2,628.16 kg, with 243.3 kg of waste, or approximately 7.9% of the total materials used. This figure indicates that most of the materials have been utilized efficiently, although there is still potential for efficiency improvements, especially in the fabric cutting and dacron filling stages, which generate the most waste.

B. Calculation of Benefit-Cost Ratio (BCR)

Economic feasibility evaluation is performed by calculating the Benefit-Cost Ratio (BCR), which compares the total benefits and total costs of the production process. The following is a breakdown of the benefit and cost components:

a) Benefit Details

Table 4.2 Benefits of production

BENEFIT COMPONENTS	CALCULATION	TOTAL (RP)
Pillow Product Sales	3000 pcs x Rp. 35000	Rp. 105,000,000
Sale of Remaining Pleats	2.1 kg x Rp. 4500	Rp. 9,450
Residual Plastic	3 kg x Rp. 5500	Rp. 16,500
Cardboard box	2 kg x Rp. 5000	Rp. 10,000
Sales of Fabric Remains from Cutting	35.68 kg x Rp. 4500	Rp. 160,560
TOTAL BENEFIT		**Rp. 105,196,510**

b) Cost Details

Table 4.3Cost/production process costs

Cost Components	Estimated Amount	Unit	Unit Price / KG	Total Cost (Rp)
Dacron HCS	2400	kg	Rp. 18,000.00	Rp. 43,200,000
Polyester Fabric (4 rolls)	149.76	kg	Rp. 94,815.00	Rp. 14,199,494
Thread (8 rolls)	4	kg	Rp. 120,000.00	Rp. 480,000
Vacuum plastic	25	kg	Rp. 72,000.00	Rp. 1,800,000
Plastic labels	30	kg	Rp. 80,000.00	Rp. 2,400,000
Strap	10	kg	Rp. 28,000.00	Rp. 280,000
rope	32	kg	Rp. 30,000.00	Rp. 960,000
Production workforce				Rp. 3,800,000
Production electricity (blower, vacuum, sewing, etc.)				Rp. 1,250,000
Machine maintenance costs				Rp. 2,300,000
Waste management costs (transportation, sorting, etc.)				Rp. 50,000
TOTAL COST				Rp. 69,099,494

Thus, the BCR value can be calculated as follows:

$$\text{BCR} = \frac{Total\ Benefit}{Total\ Cost} = \frac{105{,}196{,}510}{69{,}099{,}494} = 1{,}52$$

A BCR of 1.52 indicates that every investment in the production process yields a benefit of Rp. 1.52. This indicates that the project is economically viable and provides significant benefits to the company. The Benefit-Cost Ratio (BCR) of 1.52 demonstrates that any investment in production improvements yields benefits greater than their costs. This means that this strategy is not only environmentally sound but also economically profitable. Furthermore, the sale of leftover fabric and Dacron demonstrates the productive use of waste, in accordance with circular economic principles. However, the Dacron filling process still generates significant waste, necessitating increased efficiency. Overall, Green Productivity has proven effective as an integrative approach to increasing productivity while protecting the environment.

4. CONCLUSION

Based on the analysis and discussion conducted in the evaluation research on the application of Green Productivity in the production process of Dacron pillows at CV. Jesselyne, the following conclusions can be drawn:

a) The application of Green Productivity in the Dacron pillow production process at CV. Jesselyne has proven effective in increasing production efficiency and reducing environmental impact. This is reflected in the Material Balance analysis, which shows that most raw materials are optimally utilized, and waste generation is successfully reduced and managed.
b) The results of the economic feasibility evaluation using the Benefit-Cost Ratio (BCR) method, which was 1.52, demonstrated that implementing the Green Productivity strategy is feasible and financially profitable. Each investment yields a benefit of Rp. 1.52, indicating that this strategy successfully combines environmental sustainability with economic benefits.

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