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Environmental Sustainability and the Demand for Recycled Paper: A Case Study of Production and Supply Chain Management at PT. Recycled Paper Hub in the B2B Industry

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Abstract: This paper aims to explore PT. Recycled Paper Hub's response to the increasing demand for recycled paper within the context of sustainable production management and supply chain management, with a focus on the B2B industry. The study encompasses an analysis of the company's practices in managing relationships with suppliers of recycled paper, enhancing operational efficiency, and mitigating environmental impacts from its operations. PT. Recycled Paper Hub, a B2B company specializing in processing recycled paper into bales, faces rising demand for its products. This article presents research findings on how the company addresses the growing market demand through the utilization of advanced production technology and the application of lean manufacturing methods to minimize waste. Furthermore, the research evaluates how PT. Recycled Paper Hub manages relationships with suppliers of recycled paper to ensure stable and high-quality supply. Strategic partnerships with suppliers of recycled paper are identified as key success factors in meeting increasing demand. The research findings indicate that the increased demand for bales of recycled paper not only reduces waste and emissions but also reinforces PT. Recycled Paper Hub's commitment to sustainability. These findings offer valuable insights for the paper industry and other companies seeking to adopt more sustainable business models.

Keyword: Environmental Sustainability, Recycled Paper Demand, Paper Recycling, Waste Reduction, Supplier Management.

INTRODUCTION

The paper industry is one of the sectors with a significant environmental impact. Traditional paper production requires substantial amounts of wood, water, and energy and generates a large volume of waste. According to data from the Environmental Paper Network (2021), paper production contributes approximately 4% of global CO₂ emissions.

Additionally, this industry is a major consumer of natural resources, particularly wood and water, and a significant producer of waste, including air and water pollutants.

As global awareness of environmental issues increases, the demand for more eco-friendly products is rising. One emerging solution is the use of recycled paper as a raw material for new paper production. PT. Recycled Paper Hub focuses on processing wastepaper into bales, which are then sold to other companies as raw material for new paper products. With increasing environmental regulations and consumer demand for more sustainable products, companies like PT. Recycled Paper Hub are strategically positioned to capitalize on these opportunities. However, to meet this growing demand, PT. Recycled Paper Hub must manage its operations effectively and sustainably. This includes maintaining a stable and high-quality supply chain for wastepaper and implementing efficient and environmentally friendly production practices. Proper management of these aspects will enable the company to support environmental sustainability goals while maintaining strong economic performance.

METHOD

This study employs a case study approach to gain an in-depth understanding of how PT. Recycled Paper Hub handles the increasing demand for wastepaper bales through sustainable production management and supply chain management practices. This methodology involves collecting data from various sources and comprehensive analysis quantitatively.

A case study approach was chosen because it allows for a deep exploration of phenomena in real-life contexts, which is highly relevant for understanding the operational and strategic dynamics at PT. Recycled Paper Hub (Yin, 2018). This case study focuses on analysing the company's internal and external processes, including how it interacts with suppliers and customers in the context of sustainability.

Secondary data comes from PT. Recycled Paper Hub's annual reports, internal documents, environmental reports, and related industry publications. This data provides operational context and information about the company's sustainability strategies, as well as market trends and industry regulations affecting the demand for wastepaper bales. Primary data is collected through in-depth interviews with PT. Recycled Paper Hub's production managers, supply chain managers, and key suppliers. These interviews are designed to gather insights into production management practices, supply chain management, and operational challenges the company faces in responding to increasing demand.

Direct observations are conducted at PT. Recycled Paper Hub's facilities to understand the wastepaper bale production process and daily operational practices. These observations help validate data from interviews and company documents and provide a clearer picture of efficiency and sustainability in the production process (Merriam & Tisdell, 2015).

Content analysis is used to identify main themes and patterns in qualitative data from interviews and company documents. This technique helps understand PT. Recycled Paper Hub's management practices and sustainability strategies.

Descriptive statistics are applied to quantitative data from operational and environmental reports to describe trends in production, raw material usage, and environmental impact. This analysis provides a quantitative overview of the company's performance in managing production and the supply chain.

Triangulation is performed by comparing findings from various data sources (secondary data, interviews, and observations) to enhance the validity of the research results. This technique allows data verification through cross-confirmation from multiple data collection methods (Denzin, 2017; Flick, 2018).

Validity

- a. Construct Validity: Achieved by using relevant theoretical frameworks in designing interview questions and data analysis (Yin, 2018).
- b. Internal Validity: Achieved through data triangulation from various sources and methods (Golafshani, 2003).
- c. External Validity: Achieved through a comprehensive description of the case study context, making the findings applicable to similar situations (Yin, 2018).

Reliability

- a. Data Reliability: Achieved through systematic data collection procedures and the use of consistent data collection tools (Bryman, 2016).
- b. Analysis Reliability: Achieved by documenting the data analysis process in detail, enabling replication by other researchers (Guba & Lincoln, 1985).

RESULT AND DISCUSSION

Framework

An operational plan is a crucial component of a business strategy that outlines how tasks are executed, the workflow from start to finish, and the necessary resources for each stage of the process. The primary aim of an operational plan is to effectively manage and guide the business processes. In a business context, the operational plan serves to provide clear guidance to all stakeholders by detailing essential information about the business process, including its current state, resource allocation, objectives, roles and responsibilities, and the specific actions required. This plan enables each department to focus on their role in achieving the broader company vision by clearly identifying how each member collaborates within the organization. Below is the operational framework:

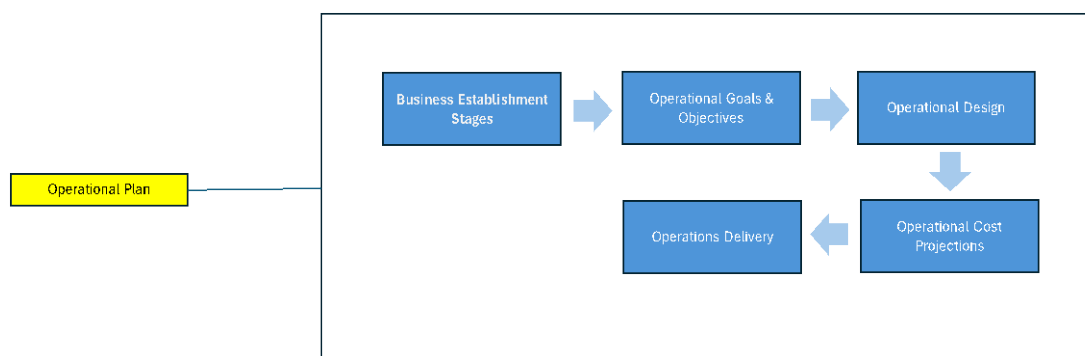


Figure 1. Framework

Establishment Stages

We plan to establish a business called Recycled Paper Hub by forming a limited liability company (PT) named "PT. Recycled Paper Hub" in accordance with the provisions of the Indonesian Law No. 40 of 2007 concerning Limited Liability Companies.

To operate the recycled paper business at PT. Recycled Paper Hub, several business permits and administrative procedures need to be managed. Below are some of the permits and procedures that must be considered: (1). Business Establishment Permit: To establish the company, we need to obtain business establishment permits such as the Trade Business License (SIUP) and the Company Registration Certificate (TDP) from the local Department of Industry and Trade. (2). Location Permit: Ensure that the land intended to be used as the warehouse and office for PT. Recycled Paper Hub meets the required standards and permits. This includes land use permits or building usage permits from the Integrated Licensing Agency (BPT) and the local Investment and One-Stop Service Office (DPMPTSP). (3). Environmental Permit: Obtain environmental permits from the Environmental Agency (BLH) or the local

Environmental Service Department. This is to ensure that the recycled paper business complies with applicable environmental protection standards. (4). Disturbance Permit: To maintain good relations with the surrounding community, we will manage disturbance permits for noise or activities that may potentially disrupt the community. To acquire this permit, we will gather signatures of approval from the local residents. (5.). Tax and Company Registration: We will register PT. Recycled Paper Hub with the Tax Office and the local Department of Finance to obtain a Taxpayer Identification Number (NPWP) and comply with the applicable tax payment regulations.

In addition to the permits, there are several preparations required before commencing operational activities, including securing warehouse leases, purchasing equipment, forming a team, and more. The following outlines the preparations for establishing the business: (1). Securing Warehouse Leases. (2). Purchasing Equipment. (3). Team Formation. (4). Operational Planning. (5). Financial Planning. (6). Marketing and Sales Strategy. (7). Legal Compliance. Below is the preparation for business establishment:

Subject	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24
Business Registration	✓	✓				
Business Licensing		✓	✓			
Warehouse Leasing			✓	✓		
Purchase of Work Equipment				✓	✓	
Team Formation				✓	✓	
Employee Training					✓	✓
Supplier Selection						✓
Courier Selection						✓
Operational Opening						✓

Tabel 1. Business Establishment Preparation

Operational Goals and Objectives

In line with the core objectives of the company outlined in the QSPM matrix, which are to enhance the quality of services, products, and infrastructure, the operational goals and objectives we aim to achieve include:

Operational Goals	Operational Objectives	Operational Target
Short Term (Y1-Y2)	<ul style="list-style-type: none"> ● Consistently conduct production processes with a target volume of 800 to 1,200 tons per month. ● Maintain maintenance costs below IDR 350 million per month. 	1. Develop measurable monthly and weekly production plans
		2. Tighten product inspection and quality testing at all production stages
		3. Implement preventive maintenance schedules
Medium Term (Y3-Y5)	<ul style="list-style-type: none"> ● Increase recycled paper production capacity by 20% - 25% in line with market share growth. ● Keep maintenance costs below IDR 350 million per month. 	1. Increase employee overtime to meet production needs
		2. Collaborate with spare part vendors for competitive pricing
		3. Review more effective preventive maintenance activities
Long Term (>Y5)	<ul style="list-style-type: none"> ● Increase recycled paper production capacity by 25% in line with market share growth. ● Maintain maintenance costs below IDR 350 million per month. 	1. Add manpower for production machine operators to increase production volume
		2. Expand partnerships with wider range of recycled paper suppliers
		3. Conduct regular inspection and replacement of spare parts

Tabel 2. Operation Goals and Objective

Operational Design

Effective and structured operational design can assist organizations in achieving their objectives as outlined in the QSPM matrix, focusing on Developing Service Quality, Products, and Infrastructure. Operational design encompasses product design, layout, flow of goods or services, and process technology. By implementing appropriate operational design, organizations can enhance efficiency, productivity, and competitiveness.

Product Design

PT. RPH produces products in the form of Cubes, which are the result of processing recycled paper through a Baling Press machine.



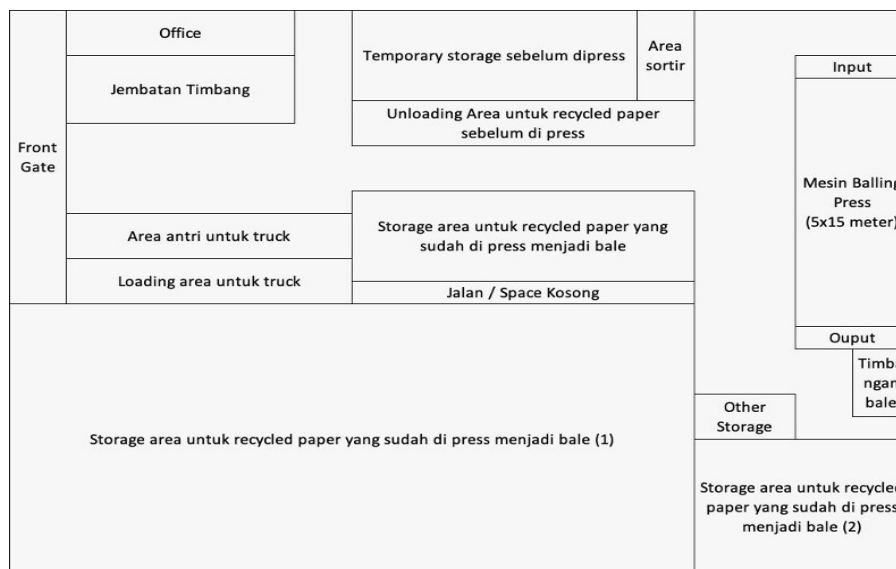
Picture 1. Baling Press Machine



Picture 2. Wastepaper after process

Warehouse Layout

PT. RPH has a warehouse that serves as a storage facility for raw paper materials.

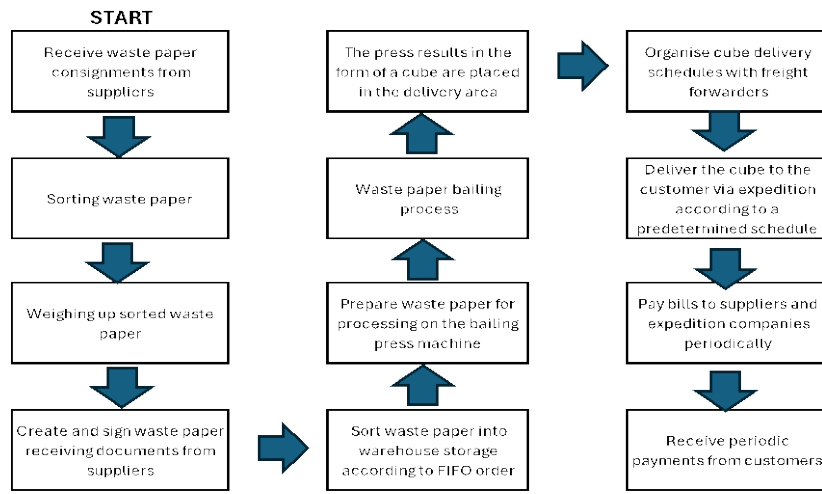


Picture 3. Warehouse Layout

Flow of Goods

Goods flow is a diagram that depicts the movement of goods or materials in a business process. The flow of goods helps visualise and understand how products or services are made, from raw materials to the final product that is ready to be distributed to customers. The goods flow diagram illustrates the movement of goods or materials within a business process. It helps visualize and understand how products or services are created, starting from

raw materials to the final products ready for distribution to customers. The following is the distribution flow of PT. RPH:



Picture 4. Flow of goods

Technology Process

PT RPH uses a press called the Baling Press. This tool is able to convert waste paper raw materials into waste paper in the form of a Cube which will later be distributed to customers.



Picture 5. Baling Press Machine



Picture 6. Hygrometer



Picture 7. Vertical Hydraulic Baling Press

With the following production scenario:

Tabel 3. Production Scenario

Bale / D	in Ton / D	in Ton / M	in Ton / Y	Case
96	48,000	1,152,000	13,824,000	Normal
120	60,000	1,440,000	17,280,000	OvertimeT 2 hour
192	96,000	2,304,000	27,648,000	Man Power / Shift +1

Along with the sales plan, the company will increase production volume by increasing operating hours for 2 hours in years 3 and 4, and adding 1 machine operator / shift in year 5.

Operation Delivery

The operations deliverables explain how our business can carry out its day-to-day activities to achieve the objectives set out in the QSPM matrix. The operations deliverables outline the concrete steps in running a recycled paper business, namely supply chain management, inventory planning and control and quality management.

Supply Chain Management

In conducting its business, PT Recycled Paper Hub implements upstream supply chain management, and downstream supply chain. The following is an overview of supply chain management at PT Recycled Paper Hub:

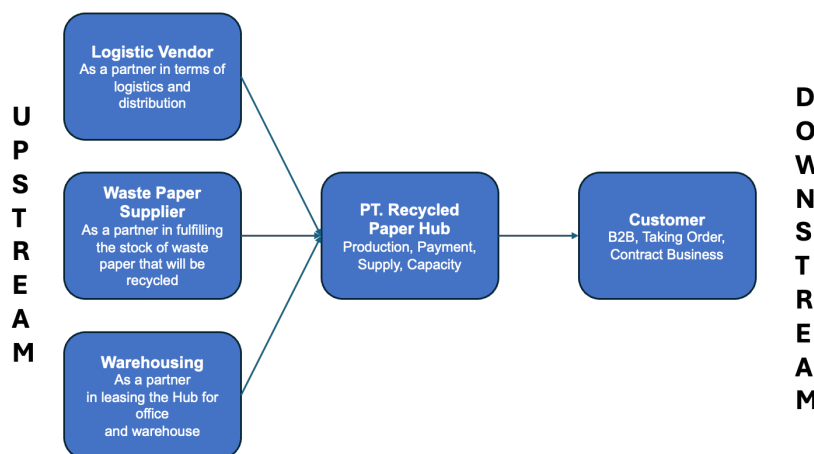


Figure 2. Supply Chain Management

Planning and Control

PT Recycled Paper Hub has 2 stages in planning its operational processes, namely the pre-operational stage for 2 years, and the operational stage for 3 years.

Pre Operational Planning

Pre Operational Planning is the planning stage carried out before the official start of business operational activities. The focus is on preparing everything needed to run the business smoothly and efficiently. The following are the stages:

1. Establishing a company flag in the name of PT Recycled Paper Hub
2. Searching for and leasing a warehouse or HUB in Central Java
3. Purchasing a baling press machine used for the production of recycled paper
4. Purchase and fulfilment of company inventory for office administration needs
5. Searching for contracts with XPDC vendors and waste paper suppliers
6. Conducting market research and customer search
7. Conduct employee recruitment and training preparation

8. Making SOPs and Company Regulations in accordance with applicable procedures

Operation Plan

Operational planning is the process of translating business strategies and objectives into concrete steps that can be implemented in day-to-day operations. It is an integral part of our Business Plan which serves as a roadmap to achieve business objectives. In accordance with the company's core objective of developing quality services, products and infrastructure. The following is the planning at the operational stage:

Determining the Type of Waste Paper

Determining the type of waste paper to be managed is the first step of operational planning. We identified various types of paper such as; HVS paper, cardboard, newsprint, triplex paper, and several other types of paper. In addition, we also analyse market demand to find out what type of paper is most in demand by paper industry companies as our customers and consider trends in the paper industry to get an idea of what type of paper will have potential value in the future. After that, we evaluate the characteristics of each type of waste paper to get an idea of the weight, moisture content, and other contents contained in each type of paper. Only then, we can determine what type of paper is most suitable for our company's needs, so it is found that the type of cardboard paper is the most suitable for our company's needs. After we get the right type of paper, we set quality standards for each paperboard/cardboard that we receive from suppliers. The scope of the quality standard includes the cleanliness of the paper, the moisture content, and the purity level (contaminants) of the paper.

Building a Supplier Network

Building a supplier network is the next step in our operational planning process. We identify potential sources of waste paper that can fulfil our needs, such as; waste banks, waste paper collectors, and companies that produce waste paper. We also establish working relationships with environmental organisations and local communities. After determining and securing potential sources of waste paper, we establish long-term partnerships with trusted suppliers of quality waste paper by establishing a fair and transparent contract and payment system.

Processing Process

After the process of selecting potential sources of waste paper, we made an operational plan for the stages of the paper processing process. Our warehouse has a strategic advantage in terms of location. Standing in an area surrounded by potential suppliers and geographically located at the centre of the distribution channel, gives us easy access to suppliers and customers. Our warehouse has sufficient storage space to fulfil our production target of 1.1 million tonnes / month. Our warehouse also has adequate working space with several supporting facilities such as open gardens, parking spaces for employees and logistics partners. We also consider environmental impact issues arising from operational activities. Our company has obtained a permit in accordance with PP No. 27 of 2012 concerning Environmental Permits. In addition, our company has also been certified with ISO 14001. We analysed the selection of technology and equipment we use for the paper sorting process and waste paper press machines in accordance with the company's financial funds, warehouse capacity, production targets, maintenance costs and quality of results. The tool we use to sort paper from suppliers is a Hygrometer Press that functions to measure the humidity level of the paper. While the press machine we use is a Bailing Press machine that is able to convert waste paper raw materials into Cube with a daily production capacity of 48 thousand tonnes. Waste paper raw materials that have been sorted through the Hygrometer Press are processed on the Bailing Press machine. After processing, the waste paper raw material becomes a Cube shape which will

then be moved by forklift to the storage area or directly transferred to the waiting delivery area to continue the distribution process to customers. We ensure that every technology we use in the processing process meets environmental safety standards. We develop a regular maintenance programme to ensure the smooth operation of technology and equipment.

Sales of Waste Paper

To determine the target market, our company identifies paper mills that require waste paper raw materials for their production. In addition to paper mills, we also identify paper collectors who purchase waste paper for resale in the domestic and international markets. To obtain accurate target markets, we also analyse the needs and preferences of each target market, consider trends and developments in the waste paper market to identify new market opportunities. We selectively choose the most profitable target markets that match our production capacity and business capabilities. Considering factors such as access to the market, competition with similar companies, and minimising risks that will arise in the future. In order to build our customer network, we conduct market research to identify potential buyers, attend trade shows, industry conferences, and other events. Building relationships with industry organisations and associations related to the waste paper business. Building long-term relationships with trusted customers by providing excellent services such as on-time delivery, high quality waste paper with a high purity level is also important to keep the waste paper business sustainable. To set a selling price that is acceptable to customers, we consider several aspects, including; purchase volume, contract period, and payment method. The higher the purchase volume and the longer the contract period, we offer special prices or discounts to attract customers with the aim of increasing sales.

Logistic Management

Determining the transport and storage system is one of the things we pay attention to. We choose an efficient and economical transport system by considering delivery distance, transport costs, and delivery time. Cooperate with local logistics companies to get convenience in the fleet delivery process and get competitive prices without compromising the quality of delivery. We are committed to maintaining on-time delivery to meet customer needs by regularly monitoring and evaluating the performance of the logistics team to ensure on-time delivery. For the storage process, we prepare adequate storage space to accommodate waste paper before and after processing according to the daily production capacity.

Waste Management

As we know that every production must produce waste. This waste is in the form of scraps of waste paper that do not pass the sorting process, dust and debris generated from the paper press process, waste generated from factory activities such as plastic or metal, and various other wastes. For this reason, we identified the types of waste. We evaluated various waste management methods such as; waste paper recycling, composting, and wastewater treatment. In addition, we also build good co-operation with local environmental authorities and waste management service companies. We are committed to implementing the 3R principles of Reduce, Reuse, Recycle. Several ways, including; reducing the amount of waste generated by optimising the processing process, reusing materials that can still be used for the processing process or for other purposes, recycling bekas paper waste that cannot be reused to produce new products. We are committed to continuing to reduce negative impacts on the environment by regularly monitoring and evaluating waste management performance.

Operational Control

Operational controls are a series of processes and activities that are carried out to ensure that business operations run according to plan and achieve the objectives that have been set. The following are our company's operational controls:

1. Performance Monitoring:

- a. Establish KPIs (Key Performance Indicators) for each aspect of operations
- b. Periodically monitor performance and conduct data analysis
- c. Identify areas that need improvement

2. Quality Control:

- a. Conduct regular inspection and quality testing of waste paper
- b. Ensure the products produced meet the set standards
- c. Take corrective action if quality deviations occur

3. Cost Control:

- a. Calculate and analyse operational costs
- b. Seek ways to optimise the use of resources and reduce costs
- c. Establish effective budgets and expenditure controls

4. Risk Management:

- a. Identify and analyse operational risks
- b. Develop risk mitigation strategies to minimise negative impacts
- c. Have a backup plan for unforeseen situations

5. Reporting and Evaluation:

- a. Prepare regular operational performance reports
- b. Evaluate operational effectiveness and efficiency
- c. Make improvements and adjustments to the operational plan

Effective planning and control in the operational stage is key to achieving the business objectives of the waste paper management and sales plan. With careful planning and systematic control, this business can run efficiently, productively, and profitably.

Quality Management

Quality management in a recycled paper business involves a series of activities and practices to ensure that the recycled paper products produced meet the set impurity standards. The following are some of the steps in implementing impurity management in the recycled paper business:

1. Determination of Impurity Standards

We define clear impurity standards for recycled paper products including specific impurity parameters, namely strength, thickness, cleanliness, and material composition.

2. Raw Material Monitoring

The raw materials used by our company to produce recycled paper are high-impurity waste paper. And periodic testing and inspection of the raw materials to ensure cleanliness and consistency.

3. Controlled Production Process

Our company implements a controlled production process to ensure product impurities. Clear production measures are implemented, including procedures for collecting, sorting, washing, shredding, and processing waste paper into the desired recycled paper.

4. Product Impurity Testing

Our Company conducts regular impurity testing on the recycled paper products produced. Testing may include the cleanliness and impurities of recycled paper raw materials.

5. Defect Identification and Repair

Our company routinely identifies the causes of defects or impurity problems in the products and makes necessary corrections. Establish an effective defect reporting and follow-up system to ensure impurity issues are addressed quickly and appropriately.

6. Impurity Training and Awareness

To improve the quality and performance of our employees, we conduct training on sorting practices to maintain good impurity levels of raw materials and the importance of complying with established impurity standards.

7. Customer Feedback

Our company regularly evaluates customer feedback on the impurities of the recycled paper products provided to improve the production process and overall product impurities.

8. Certification and Accreditation

Our company is ISO 9001 certified, which recognises a robust impurity management system. This certification increases customer confidence and demonstrates commitment to quality product quality management.

9. Performance Monitoring and Measurement

In order to maintain our service quality, we conduct regular performance monitoring and measurement to evaluate the effectiveness of our production management system.

Operational Cost Projections

Creating various scenarios and accurate assumptions is an important step in the projection of operational costs and the creation of the overall Business Plan. There are three scenarios to consider such as optimistic scenario, pessimistic scenario, and realistic scenario. All three describe how the company's management sees the projected economic and business conditions in the next one to five years. While the assumptions explain the real conditions that occur in each scenario, for example in an optimistic scenario, the assumptions are that product demand is high, operational efficiency is high, raw material prices tend to be stable, and so on. Here is an overview of scenarios and assumptions in our company:

Tabel 4. Operational Cost Projections

Tahun	1st Year	2nd Year	3rd Year	4th Year	5th Year
Raw Material Cost	IDR 36.570.000.000	IDR 36.570.000.000	IDR 45.792.000.000	IDR 45.792.000.000	IDR 73.140.000.000
Machine Purchase Cost	IDR 2.000.000.000	IDR -	IDR -	IDR -	IDR -
Other Equipment Costs	IDR 2.000.000.000	IDR -	IDR -	IDR -	IDR -
Machine Maintenance Cost	IDR 350.000.000	IDR 350.000.000	IDR 437.500.000	IDR 437.500.000	IDR 700.000.000
Warehouse Rental Fee	IDR 500.000.000	IDR 500.000.000	IDR 500.000.000	IDR 500.000.000	IDR 500.000.000
Transport Vendor Fee	IDR 800.000.000	IDR 800.000.000	IDR 1.000.000.000	IDR 1.000.000.000	IDR 1.600.000.000
Operational Car Costs	IDR 650.000.000	IDR -	IDR -	IDR -	IDR -
Forklift Rental Fee	IDR 900.000.000	IDR 900.000.000	IDR 900.000.000	IDR 900.000.000	IDR 900.000.000
Wheel Loader Rental Fee	IDR 1.200.000.000	IDR 1.200.000.000	IDR 1.200.000.000	IDR 1.200.000.000	IDR 1.200.000.000
Waste Handling Cost	IDR 100.000.000	IDR 100.000.000	IDR 100.000.000	IDR 100.000.000	IDR 100.000.000
Other Operating Expenses	IDR 366.657.400	IDR 167.910.870	IDR 191.955.413	IDR 193.652.822	IDR 239.772.626
Total Cost	IDR 45.436.657.400	IDR 40.587.910.870	IDR 50.121.455.413	IDR 50.123.152.822	IDR 78.379.772.626

CONCLUSION

The increasing demand for wastepaper bales has prompted PT. Recycled Paper Hub to proactively optimize production management and supply chain management to support environmental sustainability initiatives. By enhancing production capacity through more efficient technology and building strategic partnerships with suppliers, the company has successfully reduced operational waste and ensured a stable and high-quality supply of raw materials. Additionally, using wastepaper as the primary raw material has allowed PT. Recycled Paper Hub to significantly reduce carbon emissions and preserve natural resources, such as forests and water, while reducing the amount of waste ending up in landfills. These findings demonstrate that sustainable wastepaper management can not only be an efficient operational strategy but also provide a significant competitive advantage in the B2B market, where awareness and demand for environmentally friendly products continue to grow.

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