

THE TECHNOLOGY OF "ECOBRIK ROSTER" FROM PLASTIC WASTE IN MOSQUE BUILDING ORNAMENTS AS A RECYCLING SOLUTION

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ABSTRACT

Plastic waste management is a growing global challenge, particularly in Indonesia, which produces 1,278,900 tons of plastic waste annually. Efforts to address this issue include processing plastic waste into valuable products such as rosters, which can serve as eco-friendly solutions. This study aims to develop technology for managing plastic waste into rosters, focusing on the use of sustainable recycled materials with economic value. Based on previous research demonstrating the successful use of plastic waste in the production of paving blocks, this study adopts a similar method for producing rosters. The methods employed in this research include analyzing plastic recycling technologies, designing innovative roster products, and testing the quality of the resulting products. The findings reveal that rosters made from plastic waste possess good quality, are environmentally friendly, and have the potential to become an innovative solution for waste management in Indonesia. Furthermore, the implementation of this technology contributes to reducing plastic waste, environmental pollution, and creating new economic opportunities through the recycling industry. Thus, utilizing plastic waste to produce rosters not only supports environmental preservation efforts but also provides social and economic benefits to communities. This study is expected to encourage broader use of eco-friendly technologies in the future and increase public awareness of the importance of sustainable waste management.

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1. INTRODUCTION

The management of plastic waste is a major challenge faced by society in Indonesia. With a growing population and the expansion of industries, the use of plastic waste has also increased significantly (Making Oceans Plastic Free, 2017), Indonesia uses an average of 182.7 billion plastic bags each year, with a total weight reaching 1,278,900 tons per year. This plastic waste is non-biodegradable and has serious negative impacts on the environment. Therefore, plastic waste management has become an urgent issue that needs to be addressed with effective, environmentally friendly, and sustainable methods (Rizkita Darajat, 2020).

One potential solution that can be developed is transforming plastic waste into valuable products, such as ventilation blocks (roster). A previous study conducted by Tanjungpura University in 2022 demonstrated that plastic waste can be processed into high-quality and durable

paving blocks through proper recycling technology. Based on the findings of that study, this research develops a similar concept with modifications to produce ventilation blocks. These plastic waste-based ventilation blocks are expected not only to have good quality and durability but also to serve as an innovative solution for reducing plastic waste and creating environmentally friendly products (Lubis et al., 2022).

In the Indonesian market, ventilation block (roster) products made from plastic waste are still rarely found, presenting a significant opportunity for this product to stand out with its advantages. Through innovative technology, attractive design, and a strong emphasis on environmental sustainability, these plastic waste-based ventilation blocks are expected to become a more eco-friendly choice for consumers. This research aims to address the challenges of plastic waste management while making a positive contribution to the environment and local infrastructure through sustainable innovation (Fauzi et al., 2020).

2. METHOD

To produce ecobrick ventilation blocks, a series of work steps are required, starting from the production preparation stage, the manufacturing of ecobrick ventilation blocks, packaging and marketing, and finally, the post-production stage. The following is an explanation of these stages:

a. Ecobrick Roster Production Preparation Stage

1) Waste Identification

Identifying various types of waste that can be used as raw materials for the production of ventilation blocks. This can include plastic waste, glass, or other materials that can be processed into ventilation blocks.

2) Collaboration with Relevant Parties

Establishing collaborations with relevant parties such as local governments, recycling centers, waste management companies, or local communities to secure the supply of the necessary waste materials.

3) Collection and Selection of Waste

Creating an efficient and organized waste collection system. Preparing facilities to sort the waste according to its type to facilitate the processing and reuse of materials.

b. Ecobrick Roster Product Manufacturing Stage

1) Preparation of Raw Materials

Selecting and preparing the waste materials to be used for the production of ventilation blocks. The waste is typically cleaned, sorted, and shredded into appropriate sizes before being used in the production process.



Figure 1. Shredding of Plastic Waste.



Figure 2. Cement.



Figure 3. Sand.

2) Mixing

The prepared materials are then mixed in the appropriate proportions.



Figure 4. Mixing of Ventilation Block Materials.

3) Molding

The mixture of raw materials is then shaped into the desired forms.



Figure 5. Ventilation Block Molding.

4) Drying

After molding, the product must be dried to remove excess moisture. This process is crucial to prevent cracking in the product.

5) Quality Testing

After drying, the product must undergo quality testing to ensure it meets the established standards. This includes testing for strength, heat resistance, durability, and the aesthetic quality of the product.

6) Application

After passing the quality tests, the products that meet the standards can be marketed to the public and applied to buildings.



Figure 6. Finished Product

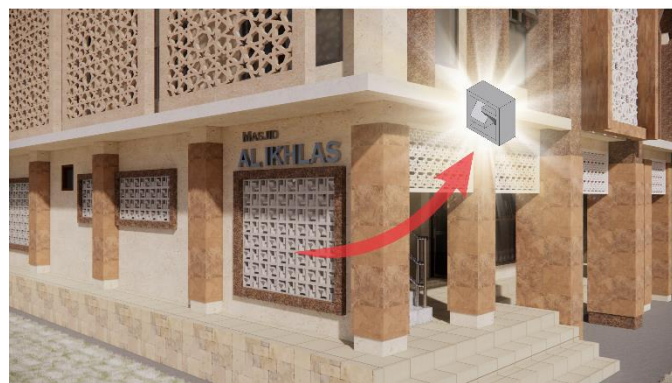


Figure 7. Examples of Ventilation Block (Roster) Applications.

c. Marketing Stage

1) Marketing Strategy Development

Identify the target market and develop a marketing strategy that aligns with the product's characteristics. This includes pricing, determining distribution channels, and creating effective promotional strategies.

2) Product Promotion

Utilize various promotional channels such as print media, social media, and trade exhibitions to increase consumer interest in the product.

3) Distribution Network Development

Build relationships with distributors, sales agents, or retail stores that can help distribute the product to a wider market.

4) E-commerce

Leverage e-commerce platforms to sell the ventilation blocks online. Provide convenience for consumers to purchase products directly through a website or e-commerce platforms.

d. Post-Production Stage

Evaluate the product strategy, marketing strategy, and publicity strategy to assess the sustainability of the business and evaluate the sales performance of the product.

3. RESULTS AND DISCUSSION

3.1 Ecobrick Roster Product Quality

Based on the research and production trials, the ecobrick ventilation blocks produced meet the standards for durability and aesthetics, making them suitable for use as decorative elements in mosque buildings. Strength tests show that this product has a high resistance to pressure and extreme weather conditions, comparable to conventional ventilation blocks made of concrete or clay.

Additionally, the plastic waste-based ventilation blocks are lighter than conventional blocks, which facilitates installation and reduces the load on the building structure. Aesthetic tests also demonstrate that ecobrick ventilation blocks can be customized into various shapes and patterns, providing flexibility in architectural design (Kompas, 2022).

Table 1. Ecobrick Roster Product Quality Chart

Parameter	Ecobrick Roster	Conventional Roster
Compressive Strength	High	High
Weight	Light	Heavy
Weather Resistance	Good	Good
Production Cost	Cheaper	More Expensive
Environmental Impact	Eco-friendly	Non-Eco-friendly

3.2 Plastic Waste Management as an Environmental Solution

Plastic waste management is one of the biggest challenges faced by modern society. With the increasing amount of plastic waste due to population growth and industrial expansion, innovative and sustainable solutions are needed. This project takes a significant step by transforming plastic waste into valuable products, namely ventilation blocks. This effort not only aims to reduce the amount of plastic waste ending up in landfills but also to create products that can be utilized in the construction industry (Sukadaryati & Andini, 2022).

The use of plastic waste to produce ventilation blocks is a highly relevant step, considering the data showing that Indonesia generates over 1.2 million tons of plastic waste per year. This initiative aligns with global efforts to reduce plastic waste and improve recycling practices (fatah, 2023).

3.3 Potential of Waste Management Technology in the Ventilation Block Industry

The technology used in this project is based on previous studies, such as those conducted by (Andriastuti et al., 2019). The results of the study showed that plastic waste can be processed into value-added products, such as paving blocks. This project adopts and modifies that technology to create ventilation blocks, which have greater potential in architectural applications.

The decision to modify the paving block production technology into ventilation blocks offers several advantages. Ventilation blocks not only function as a construction element but also have high aesthetic value. This product is expected to compete in the market,

especially with its uniqueness as an environmentally friendly product that supports sustainability (Thambas et al., 2024).

3.4 Advantages and Challenges in Producing Ventilation Blocks from Plastic Waste

The plastic waste-based ventilation block developed in this project has several advantages compared to similar products on the market. One of its advantages is the innovative technology used, which allows for the production of ventilation blocks with a lower environmental impact. Additionally, the innovative and attractive design gives the ventilation block higher aesthetic value, which can attract the interest of consumers both locally and internationally (Abadi, 2023).

However, according to (Adi permana, 2019) There are also challenges that must be faced in the production of these ventilation blocks. The main challenge is ensuring that the product quality is maintained, even though the raw material comes from plastic waste. This requires a meticulous production process, from the selection and processing of raw materials to the quality testing of the final product.

3.5 Social and Economic Impact Analysis

This project not only focuses on environmental aspects but also considers the social and economic impacts it generates. Transforming waste into ventilation blocks can create new job opportunities, particularly in the recycling sector and building material production. This can make a positive contribution to the local economy by opening up new, sustainable business opportunities (Kurniawan & Nurhamidah, 2016).

Dampak sosial lainnya adalah peningkatan kesadaran masyarakat akan pentingnya daur ulang dan pengelolaan sampah. Dengan mengaplikasikan roster daur ulang pada bangunan publik seperti masjid, proyek ini juga berperan dalam edukasi masyarakat mengenai pentingnya menjaga lingkungan (Kuntum Khaira Riswan, 2022).

3.6 Application and Market Potential

Considering the existing market potential, the plastic waste-based ventilation block has good prospects for acceptance in both local and international markets (Dini Febriani, 2023). An effective marketing strategy is key to expanding the reach of this product. Marketing through e-commerce also provides convenience for consumers to access and purchase the product directly, which is an important step in expanding the market (Rodhiah et al., 2022).

This project has the potential to become a pioneer in the plastic waste management industry in Indonesia, particularly in producing products that are not only functional but also aesthetically pleasing and environmentally friendly. With the right strategy, this product can become the top choice for environmentally conscious consumers seeking sustainable building solutions.

4. CONCLUSION

Based on the research conducted, plastic waste management through the production of ecobrick ventilation blocks has proven to be an innovative and sustainable solution for reducing

plastic waste while providing economic and environmental value. The ventilation blocks made from plastic waste not only have good quality but also function as an aesthetic construction element, especially in the decoration of mosque buildings. Furthermore, this initiative also has a positive social and economic impact, both through job creation and increasing public awareness about the importance of sustainable waste management.

This research presents bright prospects for further development in plastic recycling technology, with the potential for broader applications in the construction sector. In the future, this technology can be further developed to create other innovative, environmentally friendly products with high economic value. The results of this research are expected to serve as a foundation for future studies on plastic waste management and encourage broader adoption of recycled-based products in society.

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