SMART SYSTEM

Smart Packaging

Building Bridges: Integrating Technology and Innovation in Education

Group 10

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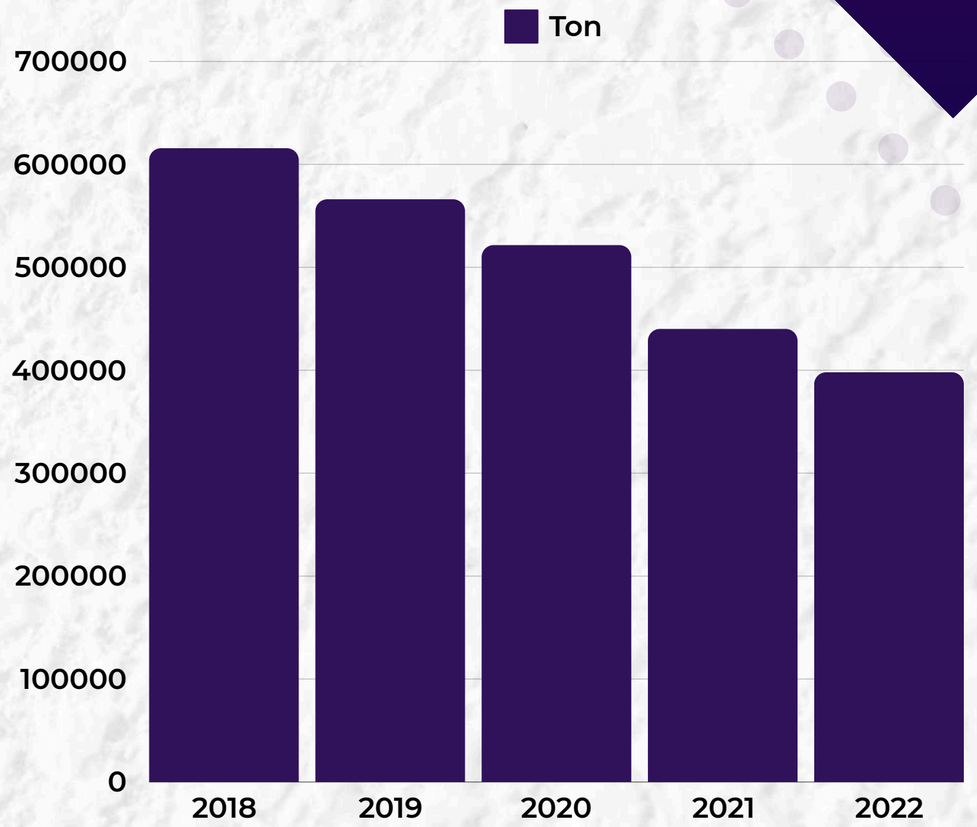
INTRODUCTION

The problem of plastic waste is not only from land. Plastic waste in the sea also causes problems, because it can disrupt the food chain and kill marine life. For this reason, the Indonesian government is working to reduce plastic waste in the sea. The target is to reduce plastic waste in the sea by **70%** by **2025**. Meanwhile, according to data from the **National Coordination Team for Marine Debris Handling (TKN PSL)**, the amount of plastic waste in Indonesian seas was **398,000 tonnes in 2022**.

That number has decreased by **35.36% compared to 2018**. Based on its origin, marine plastic waste from land has experienced the most significant decrease of **42.47%** in the last five years. The amount decreased from **538,182 tonnes in 2018 to 309,625 tonnes in 2022.** On the other hand, plastic waste from the ocean increased during the same period. In **2018**, plastic waste from the ocean was **77,000 tonnes**. The number then increased by **14.77% to 88,374 tonnes.**



Source: National Coordination Team for Marine Debris Handling (TKN PSL)

INTRODUCTION

Plastic Waste Problem

Trash From the Sea, example: waste of shrimp shell

Food loss and food waste problem

Negative impacts of Plastic

METHODS

This literature review aims to provide a comprehensive analysis of the current state of **smart packaging and electrification in reducing plastic waste**. The following steps are typically used in this method:

1. **Collection of Relevant Literature:** Gathering relevant literature on smart packaging and electrification to understand their contributions to reducing plastic waste.
2. **Analysis of Literature:** Analyzing the literature to identify themes and concepts related to smart packaging and electrification.
3. **Identification of Strengths and Weaknesses:** Identifying the strengths and weaknesses of existing smart packaging and electrification systems.
4. **Development of Theories and Concepts:** Developing theories and concepts related to smart packaging and electrification.
5. **Descriptive Analysis:** Conducting a descriptive analysis to understand how smart packaging and electrification can contribute to reducing plastic waste.

RESULT & DISCUSSION

1. Use of Sensors for Material Optimization

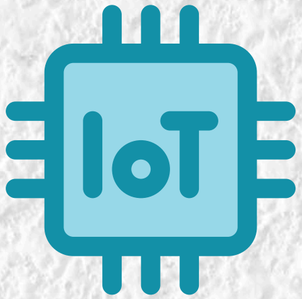
A smart packaging system uses sensors to monitor and precisely control the use of packaging materials.

2. Refillable and Reusable Packaging

Smart packaging facilitates the concept of refillable and reusable packaging through the integration of technologies such as RFID and QR codes. Electrification enables tracking and managing the packaging lifecycle, making it easier for producers and consumers to adopt sustainable packaging systems. This system can reduce the amount of single-use plastic packaging that ends up as waste.

3. RFID Technology and Recycling Tracking

RFID technology in smart packaging is not only used for product tracking but also to facilitate recycling. RFID can store information about packaging materials and recycling instructions, making the process of sorting and processing plastic waste easier. Consequently, more plastic can be recycled effectively, reducing waste accumulation in the environment.



4. IoT and Green Supply Chain Management

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5. Use of Alternative and Composite Materials

The integration of the Internet of Things (IoT) in smart packaging systems enables real-time monitoring and management of the supply chain. The data collected can be used to optimize logistics and distribution, reducing the need for additional packaging during transportation. In addition, IoT can support repackaging initiatives and the use of more environmentally friendly packaging.

6. Product Safety and Reliability

- Smart packaging can be equipped with unique identification technologies, such as RFID or QR codes connected to product databases.
- Electrification enables the integration of these technologies with sufficient power to maintain the security and reliability of product information from production to the end consumer..

7. Environmental Benefits and Impact

- Reduction of Plastic Waste Volume
- Increase in Recycling Efficiency
- Reduction of Carbon Emissions
- Increase in Consumer Awareness

8. Product Innovation and Consumer Experiences

- Smart packaging can provide consumers with additional experiences, such as more detailed product information, usage advice, or personalized promotional offers.
- Electrification supports the integration of these value-added service technologies by providing power for digital displays or interactive sensors that can enhance consumer interaction with products.

9. Challenges and Future Prospects

There are still challenges to overcome, such as the costs of implementing and adapting new technologies by industry. However, with advances in technology and increasing environmental awareness, the prospect of more environmentally friendly smart packaging is very promising and has the potential to increase the safety, quality and traceability of food products, as well as convenience for consumers.

CONCLUSION

Electrification in smart packaging systems plays an important role in efforts to reduce plastic waste. Through the use of advanced technologies such as sensors, RFID, and IoT, packaging systems can be optimized to minimize material wastage, improve recycling efficiency, and encourage packaging reuse. Thus, smart packaging not only contributes to industrial efficiency but also to environmental preservation.

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