RECYCLING STRATEGIES IN THE MANUFACTURING INDUSTRY: ADVANCEMENTS AND BEST PRACTICES

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1 INTRODUCTION

Sustainability is becoming an increasingly urgent challenge in the manufacturing industry as raw material shortages, environmental pollution, and tightening regulations significantly impact the sector. Recycling is no longer just an option but a fundamental requirement that influences companies' competitiveness and operations. While advanced recycling technologies have become widespread in the automotive and electronics industries, they are less prevalent in other sectors. Successfully implementing recycling strategies not only brings environmental benefits but also leads to cost reduction and resource efficiency. In this research, the author examined the factors influencing the success of industrial recycling strategies, the challenges hindering their adoption, and the best practices that facilitate their effective implementation.

2 MATERIAL AND METHODS

This research is based on a comprehensive literature review and case studies, in which the author examines recycling strategies in the manufacturing industry and their practical applications. The analysis primarily considers peer-reviewed scientific publications, industry reports, and findings presented at professional conferences published after 2022, ensuring the use of the most recent and relevant sources. When selecting case studies, the author focused on sustainability initiatives in various manufacturing sectors, such as the automotive, electronics, and heavy industries. The goal was to illustrate the comparison of different strategies. With this research, the author aimed to highlight successful recycling solutions and identify the barriers preventing their widespread adoption. During the analysis, the author paid special attention to the economic, environmental, and regulatory impacts of recycling, emphasizing best practices and their industrial applicability. To evaluate the results, the author conducted a literature analysis, examined industry trends, and compared sustainability indicators. The data obtained through this process provided a comprehensive overview of which recycling strategies in the manufacturing industry are the most effective and sustainable.

3 RESULTS

Based on the case studies and peer-reviewed literature analysed in this research, the author concludes that recycling strategies implemented in the manufacturing industry significantly contribute to achieving sustainability goals. The European Union's 2022 Sustainable and

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Circular Textiles Strategy sets the objective that by 2030, textile products placed on the EU market should be durable, repairable, and recyclable, made largely from recycled fibres, free of hazardous substances, and produced with respect for social rights and the environment.

The author also examined the automotive industry, where numerous companies have introduced the use of recycled materials in vehicle production, reducing raw material consumption and environmental impact. In the electronics sector, increasing attention is being given to e-waste management and the recovery of valuable materials, contributing to the implementation of the circular economy principles. For example, advancements in chemical recycling technologies enable more efficient processing of electronic waste and the recovery of valuable resources.

The author shows that industrial recycling strategies reduce raw material consumption and environmental impact, particularly in the textile, automotive, and electronics industries. The analysed literature and industrial practices indicate that successful recycling strategies rely on three key factors: the adoption of innovative technologies, support from the regulatory environment, and a shift in corporate mindset. For further progress, it is essential to improve waste management infrastructure and rethink product design to enhance recyclability.

4 CONCLUSIONS

The future of manufacturing belongs to those who see recycling not as an obligation but as a strategic advantage. This research highlights that innovation, regulatory support, and corporate mindset shifts are key to successful recycling strategies. While some industries lead, others lag due to outdated infrastructure and resistance to change. True progress requires moving beyond compliance: rethinking material design, adopting advanced technologies, and fostering industry collaboration. A more sustainable and competitive industry lies in the hands of those who adapt.

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