engineering proceedings

Abstract

Transforming Packaging Inventory Management in the Food Industry: Unleashing the Power of Industry 4.0 for Sustainability and Resilience †

Neha Jadhav [1,*], Tom Hollands [2], Sandeep Jagtap [1], Mohamed Afy-Shararah [1] and Konstantinos Salonitis [1]

[1] Sustainable Manufacturing Systems Centre, School of Aerospace Transport and Manufacturing, Cranfield University, Cranfield MK43 0AL, UK; s.z.jagtap@cranfield.ac.uk (S.J.); m.a.shararah@cranfield.ac.uk (M.A.-S.); k.salonitis@cranfield.ac.uk (K.S.)
[2] Raynor Foods Ltd., 4 Farrow Road, Widford Industrial Estate, Chelmsford CM1 3TH, UK; tom.hollands@sandwiches.uk.net
* Correspondence: neha.jadhav.781@cranfield.ac.uk
† Presented at the International Conference on Industry 4.0 for Agri-food Supply Chains: Addressing Socio-economic and Environmental Challenges in Ukraine, Leicester, UK and Online, 24–25 July 2023.

Keywords: packaging material inventory management; Industry 4.0 in the food industry; sustainable practices in food packaging; supply chain resilience in the packaging sector; circular economy and waste reduction in packaging

In recent years, the need for sustainable practices within the food industry has become increasingly important and incorporating Industry 4.0 principles can further enhance these efforts. The management of packaging material inventory can greatly benefit from the integration of advanced technologies and digitalization, leading to improved sustainability and waste reduction.

This research aims to uncover the underlying causes of significant write-offs in packaging material inventory and the corresponding costs, while simultaneously exploring the potential of Industry 4.0 in addressing these challenges. By leveraging advanced technologies like Internet of Things (IoT), Artificial Intelligence (AI), and data analytics, this study can provide insights into real-time inventory monitoring, demand forecasting, and supply chain optimization.

Through an interview-based qualitative approach, the research will identify the specific areas within the packaging material life cycle where Industry 4.0 technologies can be applied. This includes exploring solutions such as smart packaging, track-and-trace systems, and predictive maintenance to mitigate factors that contribute to write-offs, such as overproduction, improper storage, and damaged inventory.

Furthermore, the research will emphasize the role of the food circular economy and how Industry 4.0 can support its implementation. By integrating circular economy principles, such as recycling, reusing, and repurposing packaging materials, this study aims to identify strategies that optimize material flows, minimize waste, and promote a more sustainable approach to inventory management.

Overall, this research not only addresses the challenges of packaging material inventory management and sustainability, but also highlights the potential of Industry 4.0 in revolutionizing these areas within the food industry. By adopting advanced technologies and embracing circular economy principles, this study aims to drive significant improvements in waste reduction, resource efficiency, and overall sustainability, ultimately contributing to a more resilient and future-ready food industry.

Citation: Jadhav, N.; Hollands, T.; Jagtap, S.; Afy-Shararah, M.; Salonitis, K. Transforming Packaging Inventory Management in the Food Industry: Unleashing the Power of Industry 4.0 for Sustainability and Resilience. *Eng. Proc.* **2023**, *40*, 16. https://doi.org/10.3390/engproc2023040016

Academic Editor: Hana Trollman

Published: 18 July 2023

Author Contributions: Conceptualization, N.J., S.J. and M.A.-S.; methodology, N.J.; validation, N.J., S.J., M.A.-S. and T.H.; formal analysis, N.J.; investigation, N.J.; resources, S.J. and T.H.; data curation, N.J. and T.H.; writing—original draft preparation, N.J., S.J., M.A.-S. and K.S.; writing—review and editing, N.J., S.J., M.A.-S. and K.S.; visualization, N.J. and T.H.; supervision, S.J., M.A.-S. and K.S.; project administration, S.J., M.A.-S., K.S. and T.H.; funding acquisition, K.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.