

# Chapter 12

## Sustainability and Optimization of Green and Lean Manufacturing Processes Using Machine Learning Techniques

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### ABSTRACT

*The chapter introduces the concepts of sustainability, green manufacturing, and lean manufacturing, emphasizing their importance in the manufacturing industry. It then highlights the relevance of machine learning techniques in supporting sustainable manufacturing practices. It focuses on the application of machine learning in sustainable manufacturing, presenting case studies that illustrate the use of machine learning algorithms in optimizing energy consumption, reducing waste, and improving process efficiency. It also discusses the challenges and limitations of implementing machine learning techniques in sustainable manufacturing, as well as potential future advancements. Machine learning techniques can be used to achieve sustainable and efficient manufacturing operations, providing valuable insights for researchers, practitioners, and policymakers.*

DOI: 10.4018/978-1-6684-8238-4.ch012

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*Manufacturing Process Optimization for Sustainable Development Using Digital Twin Applications* Santosh Kumar Tamang,Vishnu Vijay Kumar,J. Paulo Davim,2026-05-06 Manufacturing Process Optimization for Sustainable Development Using Digital Twin Applications explores the potential of digital twin applications in the manufacturing sector with a primary focus on achieving sustainable development The edited volume provides a comprehensive overview of the interdisciplinary nature of digital twin applications considering how collaboration between engineering data science environmental science and other fields can lead to holistic and impactful solutions The content addresses the challenges and potential hurdles in implementing digital twin solutions in manufacturing while also proposing future directions for research and development in this rapidly evolving field further reviewing how digital twin technologies can be effectively applied to enhance efficiency reduce waste and improve overall productivity in manufacturing processes The role of digital twins in contributing to sustainable development goals is also analyzed including considerations such as resource conservation energy efficiency and the reduction of environmental impact throughout the manufacturing lifecycle Case studies and real world examples are included to illustrate successful implementations The publication caters to a diverse audience of professionals researchers and academics from engineering disciplines including mechanical engineers industrial engineers electrical and electronic engineers data scientists and AI engineers and manufacturing and operations managers The comprehensive approach makes it an essential resource for anyone seeking to understand the intersection of digital twin technology and sustainable manufacturing practices

[Green Manufacturing Processes and Systems](#) Paulo Davim J,2012-10-30 This book provides the recent advances on green manufacturing processes and systems for modern industry Chapter 1 provides information on sustainable manufacturing through environmentally friendly machining Chapter 2 is dedicated to environmentally friendly machining vegetable based cutting fluids Chapter 3 describes environmental friendly joining of tubes Chapter 4 contains information on concepts methods and strategies for zero waste in manufacturing Finally chapter 5 is dedicated to the application of hybrid MCDM approach for selecting the best tyre recycling process This book serves as a research book for students at final undergraduate engineering course or at postgraduate level It is a reference for professionals in industries

related to manufacturing and new green jobs green products renewable energy green services and environmental conservation

**Glocalized Solutions for Sustainability in Manufacturing** Jürgen Hesselbach, Christoph Herrmann, 2011-03-19 The 18th CIRP International Conference on Life Cycle Engineering LCE 2011 continues a long tradition of scientific meetings focusing on the exchange of industrial and academic knowledge and experiences in life cycle assessment product development sustainable manufacturing and end of life management The theme Glocalized Solutions for Sustainability in Manufacturing addresses the need for engineers to develop solutions which have the potential to address global challenges by providing products services and processes taking into account local capabilities and constraints to achieve an economically socially and environmentally sustainable society in a global perspective Glocalized Solutions for Sustainability in Manufacturing do not only involve products or services that are changed for a local market by simple substitution or the omitting of functions Products and services need to be addressed that ensure a high standard of living everywhere Resources required for manufacturing and use of such products are limited and not evenly distributed in the world Locally available resources local capabilities as well as local constraints have to be drivers for product and process innovations with respect to the entire life cycle The 18th CIRP International Conference on Life Cycle Engineering LCE 2011 serves as a platform for the discussion of the resulting challenges and the collaborative development of new scientific ideas

Innovation and Sustainable Manufacturing Carolina Machado, J. Paulo Davim, 2022-09-29 Innovation and Sustainable Manufacturing Research and Development addresses the manufacturing sustainability challenge from different points of view drawing on research from different disciplines to shed light on the latest green technologies green product design methods and materials Addressing the needs of practitioners as well as academics this book examines a range of important themes such as environmental impacts and how to assess them how to set boundary conditions to include or exclude downstream supply chains how to improve sustainability without sacrificing productivity the cost benefits of sustainability and how to trace impacts in manufacturing By providing a thorough review of global research in this field Innovation and Sustainable Manufacturing acts as an ideal entry point into this discipline for researchers and a guide to the latest developments for forward thinking practitioners Covers how different stages of the manufacturing supply chain can impact on sustainability Combines research from a variety of disciplines to provide a comprehensive coverage of this complex subject Explores the relationship between sustainability and other goals such as productivity quality and profitability

**14th International Symposium on Process Systems Engineering** Yoshiyuki Yamashita, Manabu Kano, 2022-06-24 14th International Symposium on Process Systems Engineering Volume 49 brings together the international community of researchers and engineers interested in computing based methods in process engineering The conference highlights the contributions of the PSE community towards the sustainability of modern society and is based on the 2021 event held in Tokyo Japan July 1 23 2021 It contains contributions from academia and industry establishing the core products of PSE defining the new and

changing scope of our results and covering future challenges Plenary and keynote lectures discuss real world challenges globalization energy environment and health and contribute to discussions on the widening scope of PSE versus the consolidation of the core topics of PSE Highlights how the Process Systems Engineering community contributes to the sustainability of modern society Establishes the core products of Process Systems Engineering Defines the future challenges of Process Systems Engineering

**Process Systems Engineering for Biofuels Development** Adrian Bonilla-Petriciolet, Gade Pandu Rangaiah, 2020-08-06 A comprehensive overview of current developments and applications in biofuels production Process Systems Engineering for Biofuels Development brings together the latest and most cutting edge research on the production of biofuels As the first book specifically devoted to process systems engineering for the production of biofuels Process Systems Engineering for Biofuels Development covers theoretical computational and experimental issues in biofuels process engineering Written for researchers and postgraduate students working on biomass conversion and sustainable process design as well as industrial practitioners and engineers involved in process design modeling and optimization this book is an indispensable guide to the newest developments in areas including Enzyme catalyzed biodiesel production Process analysis of biodiesel production including kinetic modeling simulation and optimization The use of ultrasonification in biodiesel production Thermochemical processes for biomass transformation to biofuels Production of alternative biofuels In addition to the comprehensive overview of the subject of biofuels found in the Introduction of the book the authors of various chapters have provided extensive discussions of the production and separation of biofuels via novel applications and techniques

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*Maynard's Industrial and Systems Engineering Handbook, Sixth Edition* Bopaya Bidanda, 2022-09-16 The classic industrial engineering resource fully updated for the latest advances Brought fully up to date by expert Bopaya M Bidanda this go to handbook contains exhaustive application driven coverage of Industrial Engineering IE principles practices materials and systems Featuring contributions from scores of international professionals in the field Maynard s Industrial Engineering Handbook Sixth Edition provides a holistic view of exactly what an Industrial Engineer in today s world needs to succeed All new chapters and sections cover logistics probability and statistics supply chains quality product design systems engineering and engineering management Coverage includes Productivity Engineering economics Human factors ergonomics and safety Compensation management Facility logistics Planning and scheduling Operations research Statistics and probability Supply chains and quality Product design Manufacturing models and analysis Systems engineering Engineering management The global Industrial Engineer IE application environments

**Energy Efficiency in Strategy of Sustainable Production Vol. II** Jörg Franke, Sven Kreitlein, 2016-11-10 Selected peer reviewed papers from the 3rd Green Factory Bavaria Colloquium 2016 November 30 December 1 2016 Convention Center Nuremberg Germany **Sustainable Industries Journal**, 2008 *Governance of Innovation Systems: Case studies in cross-sectoral policy* Organisation for

Economic Co-operation and Development,2005 This book provides lessons from case studies in policy governance for the information society and sustainable development It highlights important lessons from these policy areas for the governance of innovation policy and illustrates mechanisms and practices for better co ordination and integration across policy areas

**Web-based Green Products Life Cycle Management Systems** Hsiao-Fan Wang,2009-01-01 Despite being a relatively new field of research and development green management has drawn much attention from researchers and practitioners Facing critical impacts to its environment a strategic change to integrate supply chain management on green products needs a solid base for decision making Web Based Green Products Life Cycle Management Systems Reverse Supply Chain Utilization provides a comprehensive review of current and potential research in green management and control A unique collection in the growing field of green products this book is a must have for new and experienced researchers as well as practitioners and academicians alike **AIST Today** ,2005 **Reviews in Inorganic Chemistry** ,2007 Governance of Innovation Systems: Volume 3: Case Studies in Cross-Sectoral Policy Organisation for Economic Co-operation and Development Staff,2005 **Life Cycle Analysis Tools for 'Green' Materials and Process Selection: Volume 895** Stella Papasavva,Vasilis Fthenakis,2006-03-21 The MRS Symposium Proceeding series is an internationally recognised reference suitable for researchers and practitioners **Sustainable Manufacturing** J. Paulo Davim,2013-03-04 According to the NACFAM National Council for Advanced Manufacturing USA Sustainable Manufacturing is defined as the creation of manufactured products that use processes that are non polluting conserve energy and natural resources and are economically sound and safe for employees communities and consumers The book covers Sustainable Manufacturing techniques such as materials and manufacturing for renewable energies clean manufacturing technology ecological manufacturing energy efficient manufacturing remanufacturing recycling of materials environmentally conscious design and manufacturing processes sustainable advanced manufacturing systems manufacturability in sustainable product design education and training for sustainable manufacturing **Electrophoretic Deposition: Fundamentals and Applications IV** A.R. Boccaccini,Omer Van der Biest,Rolf Clasen,James H. Dickerson,2012-03-15 Selected peer reviewed papers from the 4th International Conference on Electrophoretic Deposition Fundamentals and Applications October 2 7 2011 Puerto Vallarta Mexico

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