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Yale Journal Explores Advances in Sustainable Manufacturing

A new special issue of the F&ES-based; Journal of Industrial Ecology explores the latest research in sustainable manufacturing and how lifecycle engineering is being used to reduce environmental impact.

In recent years, increasing pressure from policymakers, consumers, and suppliers has prompted manufacturers to set environmental targets that go beyond reducing the pollutants they emit from their smokestacks or discharge into rivers and lakes. Today companies must also assess environmental performance at every step in their process, from the mining of primary materials to the use and recycling of their products.

This perspective has given rise to the discipline known as lifecycle engineering, which connects the engineers who grapple with the efficiencies of production processes, machine design, and process chains with the industrial ecologists who develop more over-arching methods of environmental assessment.

In a special issue of the Journal of Industrial Ecology (JIE), "Sustainability in Manufacturing: The Role of Life Cycle Engineering," experts from a range of disciplines — including industrial ecologists, manufacturing and design engineers, and production and operations researchers—explore the latest research on sustainable manufacturing and how lifecycle engineering is being used to reduce environmental impact.

"At the heart of industrial ecology is an imperative to move beyond the make-now-clean-it-up-later approach that has characterized so much of our industrial society," said Reid Lifset, editor-in-chief of JIE. "Manufacturing is a point of leverage—better design and operations can have ramifications across the entire product life cycle. This is where industrial ecology meets life cycle engineering."

Some highlights from the issue include:

- Mohannad Shuaib and colleagues from the University of Kentucky introduce a Product Sustainability Index that comprehensively assesses the sustainability of a product-based on four lifecycle stages: pre-manufacturing, manufacturing, use, and post-use.
- Tatiana Tambouratzis and colleagues from the University of Piraeus present a system based on artificial intelligence for the identification of sustainable materials.
- Esther Sanye-Mengual from the Universitat Autónoma de Barcelona and colleagues argue that the maintenance of products — and strategies to influence that maintenance — should be included in product design and communications with users.
- In a complementary article, Livier Serna-Mansoux and colleagues from SEATECH/SUPMECA in France assess the relationship between consumers and products and suggest strategies that could "nudge" consumers to use products in a way that exacts lower environmental costs.
- Karsten Schischke from the Fraunhofer Institute for Reliability and Microintegration IZM and colleagues explore the potential energy savings and efficiency benefits through eco-design standards for industrial equipment, including welding equipment.

• Quanyin Tan from Tsinghua University and colleagues quantify the benefits of remanufacturing older products in China.

“This special issue of the Journal of Industrial Ecology gives insights into some latest research in life cycle engineering and sustainable manufacturing “, says Christoph Herrmann, Professor at Technische Universität Braunschweig and one of the guest-editors of the special issue. “If industrial ecology and life cycle engineering come together it opens innovation paths going beyond simple efficiency measures.“

The Journal of Industrial Ecology is a bimonthly peer-reviewed scientific journal, owned by Yale University, published by Wiley-Blackwell and headquartered at the Yale University School of Forestry & Environmental Studies.

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