



▲ Jeevaraj Pillai, Director - Sustainability, President - Flexible Packaging and New Product Development, UFlex Limited

Reducing emissions beyond renewable energy requires tackling production processes. The circular economy, encompassing reduce, reuse, recycle, and repair, offers a solution. UFlex focuses on source reduction, substitution, and sustainable materials. Since 1994, UFlex has operated recycling plants for multi-layer plastics, handling 30,000 metric tons of plastic waste annually.

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TOTAL PAGES 56

Manufacturing Today

DECISIVE TOOL FOR MANUFACTURING EXCELLENCE

VOLUME 14 | ISSUE 1 | JANUARY 2024 | ₹100



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SUSTAINABILITY

Greening the gears: Circularity reimagines the factory floor

A take on the concepts, benefits and the real-world examples of sustainable manufacturing and circular economy, highlighting their profound impact on industries and broader economy.

By Sujatha Vishnuraj

Vedanta Aluminium champion climate action through a dual strategy: reducing carbon footprint & offsetting emissions. Our achievements include India's first 'green' aluminium, Restora, made with renewable energy.

In the face of escalating environmental concerns and resource depletion, sustainable manufacturing and the circular economy have emerged as transformative approaches that aim to minimise waste, conserve resources, and foster a restorative relationship between industries and the environment. The circular economy paradigm revives used materials, shunning disposal. Manufacturers must innovate product design, production, and distribution, shifting from the linear 'take, make, waste' model towards regenerative, sustainable practices.

The manufacturing sector, responsible for over 20% of accumulated greenhouse gas emissions, is a major contributor to global environmental pollution. Moreover, manufacturing activities also have significant economic and social impacts, affecting jobs creation, economic growth and societal wellbeing. To address these challenges, sustainable manufacturing has emerged as a key concept, encompassing environmental, economic, and social dimensions.



▲ John Slaven, CEO, Vedanta Aluminium Business

Of significant impact is our partnership with recycling companies specialising in handling electronic, optic fibre, and cable waste. By ensuring proper disposal and recycling, we contribute to lower environmental impact. Remarkably, 57% of the waste generated at STL finds a second life as raw material in other industries, exemplifying the transformational impact of our sustainability initiatives.



▲ Akanksha Sharma, Global ESG Head, STL

Four pillars of sustainable manufacturing

Sustainable manufacturing encompasses four key areas interconnected to the circular economy's building blocks:

1. Sustainable supply chain:

- **Reverse logistics:** Closed-loop activities designed to minimize waste by reutilizing and recycling



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- materials, reducing the negative environmental impact of transportation, packaging, and disposal.
- **International labour relations in manufacturing supply chains:** Ensuring fair labour practices, human rights, and responsible sourcing throughout the supply chain to address the challenges of global value chains (GVCs) and global supply chains (GSCs).

2. Sustainable materials:

- **Transition to sustainable materials:** Shifting from non-renewable to sustainable and renewable materials that can be produced and reproduced without depleting resources, minimizing environmental impact, and enhancing product durability.
- **Sustainable materials management:** Implementing circular economy principles to transform materials at the end of their life cycle into new resources, promoting reuse, recycling, and resource conservation.

3. Sustainable design and production:

- **Sustainable product design:** Redesigning products to enhance environmental performance, reduce disposal costs, and promote reusability and recyclability.
- **Transforming conventional manufacturing to sustainable smart production:** Leveraging smart technologies, digital transformation, and Industry 4.0 concepts to optimize energy efficiency, reduce waste, and enable data-driven decision-making.
- **Servitization:** Shifting from traditional manufacturing to product-as-a-service (PaaS) and integrated product-service (PS) models, promoting reuse, reducing waste, and extending product lifecycles.

4. Sustainability management and policy-making:

- **Sustainability management initiatives:** Incorporating long-term sustainability plans, addressing societal challenges, and aligning corporate objectives with ESG (Environmental, Social, and Governance) requirements.
- **Internal sustainable management initiatives:** Establishing governance structures, promoting transparency, and implementing ESG-aligned strategies to foster sustainable practices within organizations.

Environmental, economic, and social value creation

The sustainable manufacturing framework emphasises the importance of pursuing environmental, economic, and social value

Sustainable manufacturing in the current times comes with a higher cost of implementation, especially when one needs to be very agile in operations to ensure that the costs are not escalated. It is therefore essential that we balance the activities such that the sustainable practices are implemented in phased manner. This highlights the disconnect between rhetoric and reality, suggesting that consumers may not be willing to foot the bill for sustainable practices. If the company's adopting sustainable practices are recognised, appreciated and awarded in the right manner, then definitely many SME's will come forward and think of adopting these practices.



▲ Mihir V Shah, Executive Director, Vipul Organics Limited

creation in all four pillars. This means maximising environmental benefits by minimising waste, using renewable resources, and embracing clean technologies. It's about building economic prosperity that empowers communities, promotes fair wages, and drives responsible supply chains.

Mihir V Shah, Executive Director, Vipul Organics Limited shares, "Our plants operate with ZLD system. It means that the plant recycles and reuses 98% of water thereby reducing the dependency on fresh water. Reusing water makes us self-sustainable in handling our effluent and at the same time reduces the charges towards the requirement of fresh water for use in production. The water treatment plants have been designed in such a way that they have primary, secondary and tertiary treatments which handles the water requirements. We also are saving significantly when we reuse the water."

"Our journey towards Zero Waste to Landfill has resulted in a fundamental shift in waste management. By optimising resource consumption and unlocking operational efficiencies, we've transitioned towards a circular economy. This journey is rooted in the repurposing of products and waste, strategically reducing scrap generation and emphasizing responsible disposal," Akanksha Sharma, Global ESG Head, STL echoes similar sentiment.

It's about fostering social well-being through safe work environments, inclusive practices, and community engagement. And lastly, it's about adhering to strong governance principles, ensuring



▲ Jeevaraj Pillai, Director - Sustainability, President - Flexible Packaging and New Product Development, UFlex Limited

transparency, accountability, and ethical conduct throughout the production cycle.

Benefits of Sustainable Manufacturing and Circular Economy

The adoption of sustainable manufacturing practices and circular economy principles offers numerous benefits for industries, the environment, and society as a whole:

1. Environmental Benefits:

- **Reduced greenhouse gas emissions:** Sustainable manufacturing can significantly reduce greenhouse gas emissions by improving energy efficiency, reducing waste, and utilizing renewable energy sources.
- **Conserved natural resources:** By minimizing material consumption and waste generation, sustainable manufacturing and circular economy practices help conserve natural resources, such as minerals, metals, and fossil fuels.
- **Pollution reduction:** Implementing pollution prevention measures helps reduce air and water pollution, minimizing the negative impacts on ecosystems and human health.

2. Economic benefits:

- **Cost Savings:** Sustainable manufacturing practices often lead to cost savings through reduced energy consumption, waste disposal costs, and improved resource utilization.
- **Increased Innovation:** The pursuit of

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sustainability and circularity encourages innovation, leading to the development of new technologies, products, and business models.

- **Enhanced Brand Reputation:** Consumers are increasingly drawn to brands that demonstrate

sustainability and commitment to environmental stewardship, leading to improved brand reputation and increased market share.

3. Social Benefits:

- **Job Creation:** The transition to sustainable manufacturing and circular economy can create new jobs in areas such as waste management, recycling, and product repair, fostering economic growth and resilience.
- **Improved Quality of Life:** By reducing pollution and conserving resources, sustainable manufacturing and circular economy practices contribute to a healthier and more sustainable environment for present and future generations.

At Jakson, we have designed our products and processes keeping in mind sustainable manufacturing and circular economy concept. Our products are designed for minimum wastage and processes for minimum consumptions thereby reducing the resources like raw material, consumables, fuel and electrical energy.



▲ Gagan Chanana, CEO & Jt. Managing Director, Distributed Energy Business, Jakson Group.

The circular economy presents a promising pathway for sustainable manufacturing practices, minimizing energy and resource consumption, and reducing environmental damage. To drive industry-wide sustainable practices, top management must take the lead in promoting corporate social responsibility and implementing centralized structures that ensure alignment and coherence across all levels of the manufacturing pipeline. Furthermore, the social aspects of sustainability require more precise metrics and indicators to address issues such as fair labor standards, diversity, and employee safety. ■