

Title:

From Centralized Factory Hubs to Micro-Manufacturing: Rethinking Production for the Renewable Carbon Economy

Abstract:

The transition toward a renewable carbon economy requires more than alternative feedstocks. It also requires a fundamental rethink of how and where products are manufactured. Today, most consumer goods are produced in highly centralized global factory hubs optimized for scale and low labor costs. This production architecture creates long supply chains, increases geopolitical dependencies and often makes circular material flows economically difficult to implement.

This presentation explores decentralized, automated micro-manufacturing as a new production model for the circular economy. By relocating smaller, highly automated production units closer to regional markets, manufacturers can significantly reduce transport distances while enabling more efficient integration of recycled and bio-based materials.

Decentralized manufacturing architectures also create new opportunities for circular product design, local material sourcing and regional recycling loops. These systems can increase supply-chain resilience while supporting the transition from fossil carbon to renewable carbon feedstocks.

Using the toy industry as an initial case study, the presentation discusses how modular micro-factories could serve as a practical framework for implementing circular manufacturing principles in consumer products.

The talk introduces a modular micro-factory concept currently under development to demonstrate how decentralized production could accelerate the adoption of renewable and circular materials.