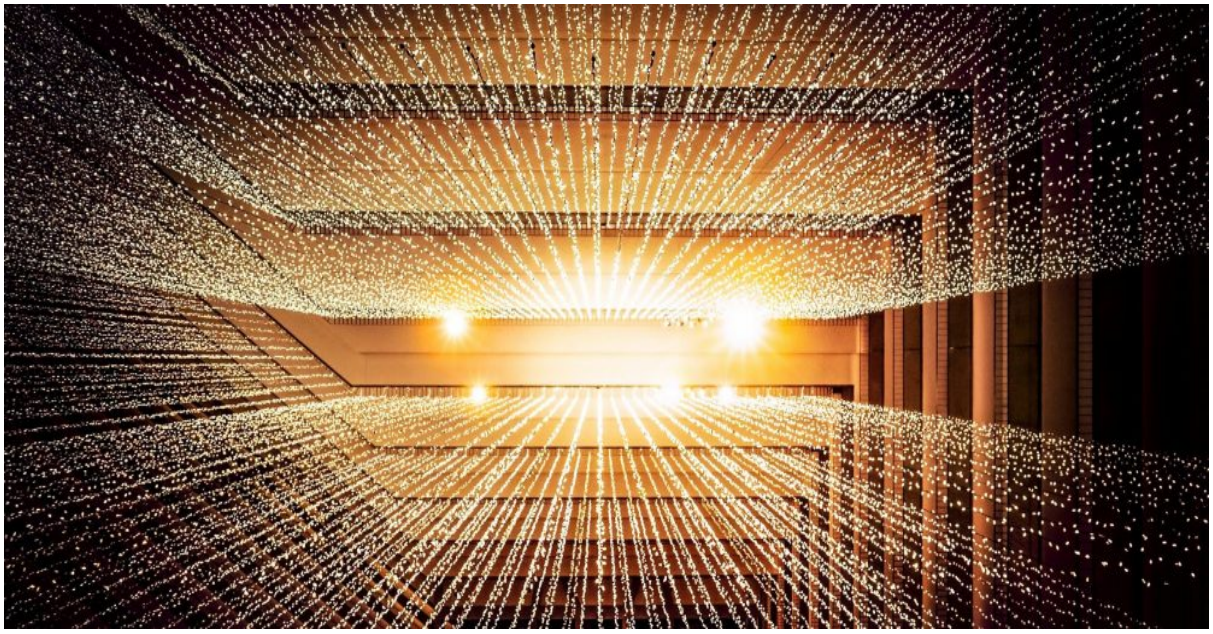
Technology-driven circular economy solution:

LanzaTech – India Glycols – Unilever Case Study



Executive summary

Advancements in technology are creating opportunities for circular businesses. Our LanzaTech – India Glycols – Unilever Case Study demonstrates how cutting-edge innovations can transform business models, create value, and significantly reduce carbon emissions. This case highlights a collaborative effort between LanzaTech (technology provider), Shougang Group (steel manufacturer), India Glycol (specialist chemicals manufacturer) and Unilever (product manufacturer) to develop more sustainable detergent products, including laundry capsules and dishwasher liquid.

The challenge

Currently, around 80% of chemicals are derived from fossil fuels, and refining and manufacturing processes are often fall short of sustainability goals. While the chemical industry is making efforts to transition to greener practices, developing a circular model presents unique hurdles. Chemical products are typically consumables—once used, they are difficult to recover. For example, retrieving fertilisers from soil or shampoo from wastewater is nearly impossible. In such cases, the focus should shift to sourcing more

sustainable raw materials in production. However, achieving sustainability while maintaining affordability remains a major challenge for businesses.

Results from CircularChem

At CircularChem, we have conducted several case studies to explore how chemical sector companies transition towards a circular economy (CE). The LanzaTech – India Glycols – Unilever Case Study is one such example, showcasing how technological advancement and value chain collaboration can drive circularity in the chemical industry—one of the largest carbon-emitting industries.

Overview of the Collaboration

LanzaTech, a pioneering technology company, has developed an innovative process to produce ethanol from captured carbon emissions. In 2011, it partnered with Shougang Group to establish Beijing Shougang LanzaTech New Energy Technology, a joint venture in Hebei province, China. This facility captures carbon emissions from steel manufacturing and converts them into ethanol, which is then sold as chemical base material. Revenue is shared between Shougang and LanzaTech.

India Glycols further processes this ethanol into surfactants, key ingredients in Unilever's detergent formulations. In 2021, Unilever launched these sustainable detergent products in China, Germany and South Africa. While customer feedback was positive, the higher production costs of recycled carbon-based surfactants posed a challenge. Typically, consumer good companies require new products to meet specific sales and profitability targets before launch. However, Unilever—a purpose driven company committed to sustainability at its core—chose to launch these products (i.e., doing the right thing) despite its business model (i.e., financial performance).

Value Creation and Capture Across the Ecosystem

The table below summaries the distinct roles each company played in creating, delivering, and capture value in the business ecosystem:

Company	Value Proposition	Value Creation & Delivery	Value Capture
LanzaTech	Customised technology enabling circular carbon recycling from industrial emissions.	• Intensive R&D and market analysis. • Customisable and adaptable technology for different waste inputs and product outputs.	• 'Plug-in' technology integrated into existing steel facilities, reducing capital costs. • Royalties from detergent sold. • Establishes a global reputation as a leader in carbon recycling.
Shougang Group	Supply of carbon through industrial emissions.	• Reduction in emissions, enhancing reputation and mitigating potential future carbon taxes. • Provision of large-scale carbon supply.	• Creation of intangible value through sustainability efforts. • Revenues generated through ethanol production.
India Glycols	Conversion of ethanol of any origin into surfactant.	• Established chemical process operating at large scale.	• Revenues from contracted services. • Cost efficiencies through economies of scale.
Unilever	High-quality, affordable, and more circular product.	• Global established manufacturing and distribution networks. • Established brand awareness and customer loyalty.	• Higher manufacturing costs. • Potential pricing risks if production costs increase. • Positions itself as a market leader ('vanguard') in producing circular detergents.

Wider implications and working with partners

This case study provides valuable insights for businesses looking to adopt CE principles.

- **Circularity is achieved through collaboration:** No single firm can achieve circularity alone; it requires multiple companies working together to create a functional ecosystem.
- **Different roles within the system:** While some companies (e.g., India Glycols) engage as part of their usual business operations, others (e.g., LanzaTech and Shougang) invest in new technologies to capture and process waste with a clear return on investment, and others take the risk of launching sustainable products despite financial uncertainties (Unilever).

- **Circular feedstocks remain costly:** Recycled carbon-based materials are significantly more expensive than their fossil-based counterparts, creating financial barriers to large-scale adoption.
- **Technology providers can drive ecosystem orchestration:** As the technology innovator, LanzaTech played a central role in orchestrating partnerships and driving the transition toward circularity.

This case study highlights both the opportunities and challenges of industrial symbiosis in achieving CE goals, demonstrating the importance of technological innovation, strategic partnerships, and corporate sustainability commitments.

References

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Researchers

- Professor Bing Xu
- Professor Umit Bititci
- Dr Melissa Marques-McEwan
- Qianqian Ma