Detergent from Captured CO_2 Business Model Case Study

Background

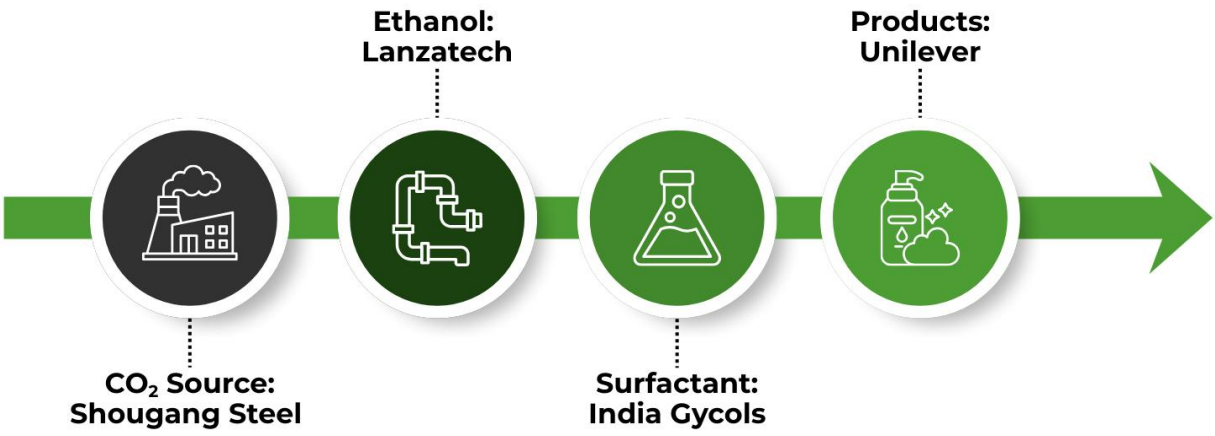
80% of chemicals are still made from fossil fuels (including household products) with refining and manufacturing processes often falling short of sustainability goals. Direct circularity for chemical products is difficult to achieve due to the challenges of retrieving chemicals from waste streams such as wastewater (soaps/detergents) or soil (eg fertilizers).

Shifting the chemical (carbon) source towards more sustainable raw materials enables the production of more 'circular' chemical products. This case study, carried out by the Interdisciplinary Centre for the Circular Chemicals Economy (CircularChem) 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.

Project outline

The technology company, LanzaTech, 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 China. This facility captured carbon emissions from steel manufacturing and converted them into ethanol, which is then sold as chemical base material.

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.



Outcomes/Impacts

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.	Technology integrated into existing steel facilities, reducing capital costs. Royalties from detergent sold.
Shougang Group	Supply of carbon through industrial emissions.	Reduced emissions, enhanced 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.	Established manufacturing and distribution networks. Established brand awareness and customer loyalty.	Higher manufacturing costs. Potential pricing risks if production costs increase.

Customer feedback was positive; however, 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 chose to launch these products (i.e., doing the right thing) despite its financial performance business model.

Challenges & Lessons Learned

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/further reading

- [1]https://bingxu1.github.io/pdfs/Unilever_CS.pdf
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