INDUSTRIAL BIOTECHNOLOGY

ENABLING THE DEVELOPMENT OF THE BIOECONOMY

Industrial biotechnology uses enzymes and microorganisms to make biobased products in sectors as diverse as chemicals, materials, pharmaceuticals, plastics, food and feed ingredients, detergents, pulp and paper, textiles and bioenergy. It is an enabler for a more sustainable and competitive bioeconomy in Europe.

Enzymes and microorganisms (bacteria or fungi) developed through industrial biotechnology play a vital role in transforming 'renewable raw materials' such as biomass, residues and CO_2 into everyday products. This provides an alternative to using fossil carbon sources, such as crude oil, natural gas or coal, as the basic feedstock.

Microorganisms can be tailored to produce interesting molecules from biomass by fermentation processes. This uses and optimises the natural synthesis capacity of the organisms. The enzymes used in biotech processes are very specific tools, which can modify one molecule into another or break down feedstock under carefully controlled conditions in order to produce the desired product. The processes, conditions and the enzymes or microorganism needed are strongly dependent on the feedstock and intended products, which is why there are so many variations in biorefinery design.

6 ways in which industrial biotechnology is contributing to a more sustainable, competitive circular bioeconomy

Enzymes and microorganisms can work at lower temperatures and at moderate pH, making them more energy and resource efficient than many chemical processes.

Enzymes are used in food processing. They reduce bread waste by extending bread softness and play an essential role in making more nutritious food products available.

Where chlorine was previously used to bleach denim and stones to stonewash them: now enzymes are used instead, reducing the energy and water required for the process, as well as harmful waste products.

EU scientists lead the world in industrial biotechnology and are continually learning from nature. Many useful biochemicals have been produced by studying and replicating the characteristics of fungi, for example, to provide an alternative to animal rennet for cheese making.

Fermentation enables the production of pharmaceutical compounds or vitamins with fewer processing steps compared to chemical transformation.

Microorganisms are being improved to enable the production of chemical building blocks from biomass instead of petrol, which can be used in textile, paints or plastics.

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USING INDUSTRIAL BIOTECHNOLOGY HAS MANY BENEFITS FOR THE ENVIRONMENT

CO_2 EMISSIONS SAVED BY 2030 BY USING ENZYMES[1]

65M TONNES
IN THE DETERGENTS, TEXTILES, PULP AND PAPER INDUSTRIES

139M TONNES
IN THE FOOD INDUSTRY

USING ENZYMES IN PULP AND PAPER BLEACHING[2]

Up to 15% Less chlorine

40% Less energy

USING FERMENTATION INSTEAD OF CHEMICAL SYNTHESIS TO PRODUCE VITAMIN B2[3]

40%	Less expensive
80%	Less non-renewable resources used
67%	Less emissions to water

"I would like to restate the European Commission's strong interest and fundamental support for what the biotech sector has to offer, namely benefits for people, the economy, and sustainability"

Vytenis Andriukaitis, EU Commissioner for Health and Food Safety

References:
1. WWF Denmark, 2009
2&3. OECD, The Application of Biotechnology to Industrial Sustainability, 2001

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