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Cell-free bioproduction

Bio-Manufacturing Solutions Workshop

10 February 2021

Conflicting demands on the world are putting **enormous pressure on the chemical industry**

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Social
Population increase
Wealth increase

Climate change
Requirement to reduce CO_2 emissions

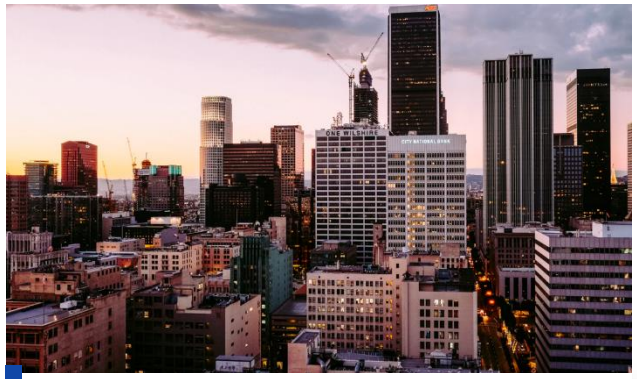
By 2050 the chemical industry needs to quadruple production and cut its emissions by more than half.

Maintaining industry growth is essential, since **chemical innovations drive emission reductions in other industries**

Example achievements of the chemical industry:

Flourescent lamps

0,7 billion tonnes of GHG saved per year



Building insulation foam

2,4 billion tonnes of GHG saved per year

Chemical fertilizers

1,6 billion tonnes of GHG saved per year

The chemical industry: delivering a low carbon future 24 hours a day. 2015. [online]
Available at: <https://www.cia.org.uk/Portals/0/Documents/Publications/Low%20carbon%20brochure_2015_MR.PDF>

Multi-enzyme cascades will become the **next generation of sustainable bioproduction**

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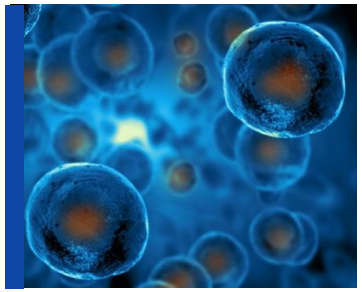
Sustainability

Process Efficiency

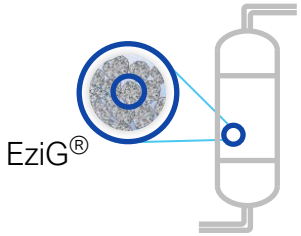
Fermentation

Poor atom efficiency from living cells



Traditional chemistry

High energy processes and fossil fuel dependency

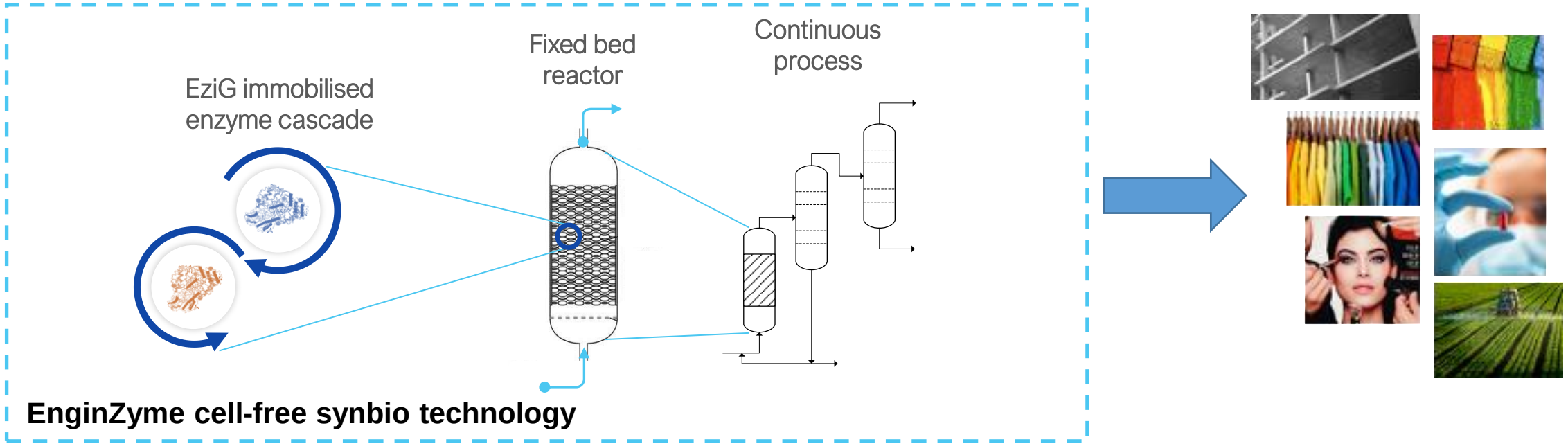


Cell-free synbio

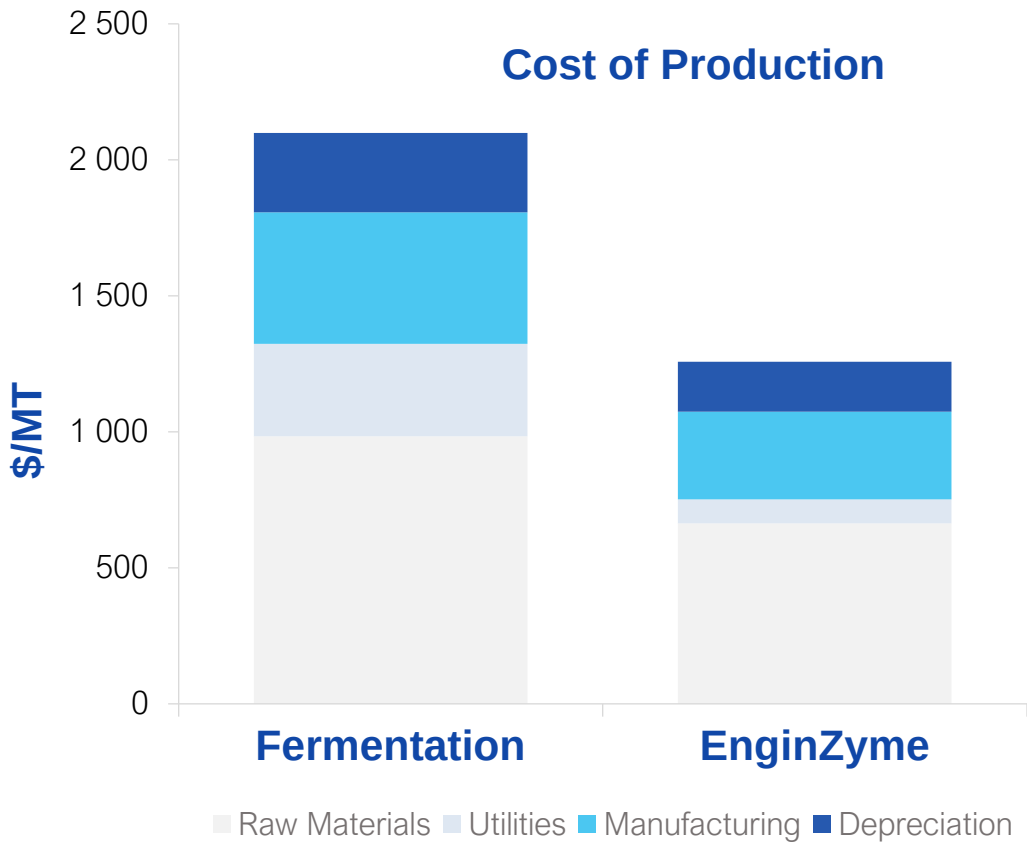
Cell-free synbio

- Avoids the complexity of fermentation combined with the efficiency of the traditional chemistry
- Utilisation of enzyme cascades outside the cell in an efficient packed bed reactor, bridging the gap between two technology platforms.

EnginZyme technology: Immobilised enzymes in **well-understood, scalable equipment**



Techno-economic comparison demonstrates **massive cost of production advantage**



40% reduction in CapEx

40% reduction in OpEx

70% reduction in Utilities

40% reduction in Raw Materials

Cost comparison done to FEL-1 standards

Cell-free synbio can access the **broadest chemical product suite**

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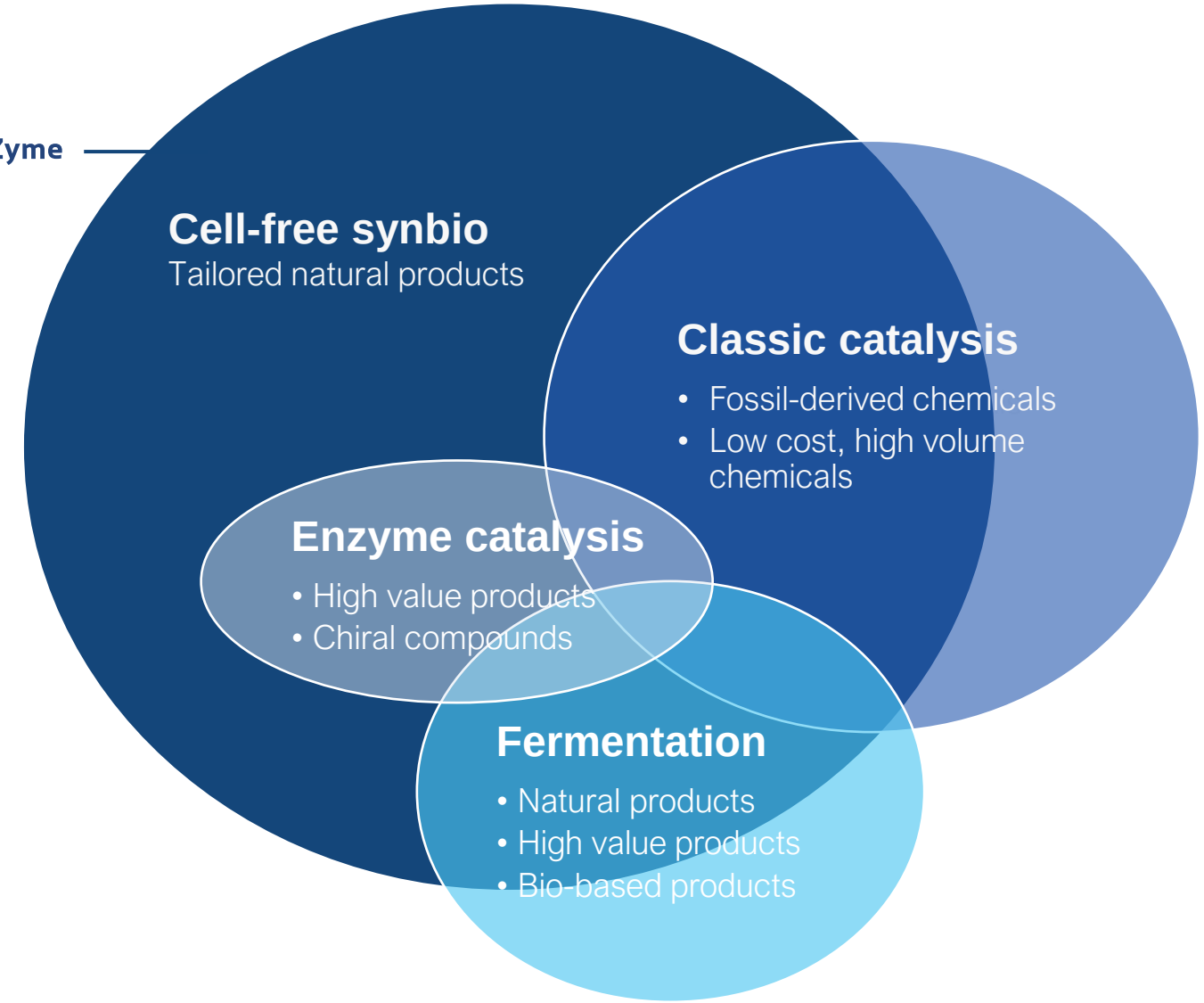

Example addressable markets:

- Paints & Coatings: $105bn
- Agrochemicals: $55bn
- Cosmetics ingredients: $8bn
- Fermentation fine chem:$25bn
- APIs: $166bn
- Solvents: $50bn
- Household cleaners: $30bn
- Sweeteners: $14bn
- Plastics: $520bn
- Polymers: $700bn
- Cement: $500bn

EnginZyme in ten years:

The “Intel” of bioproduction

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