

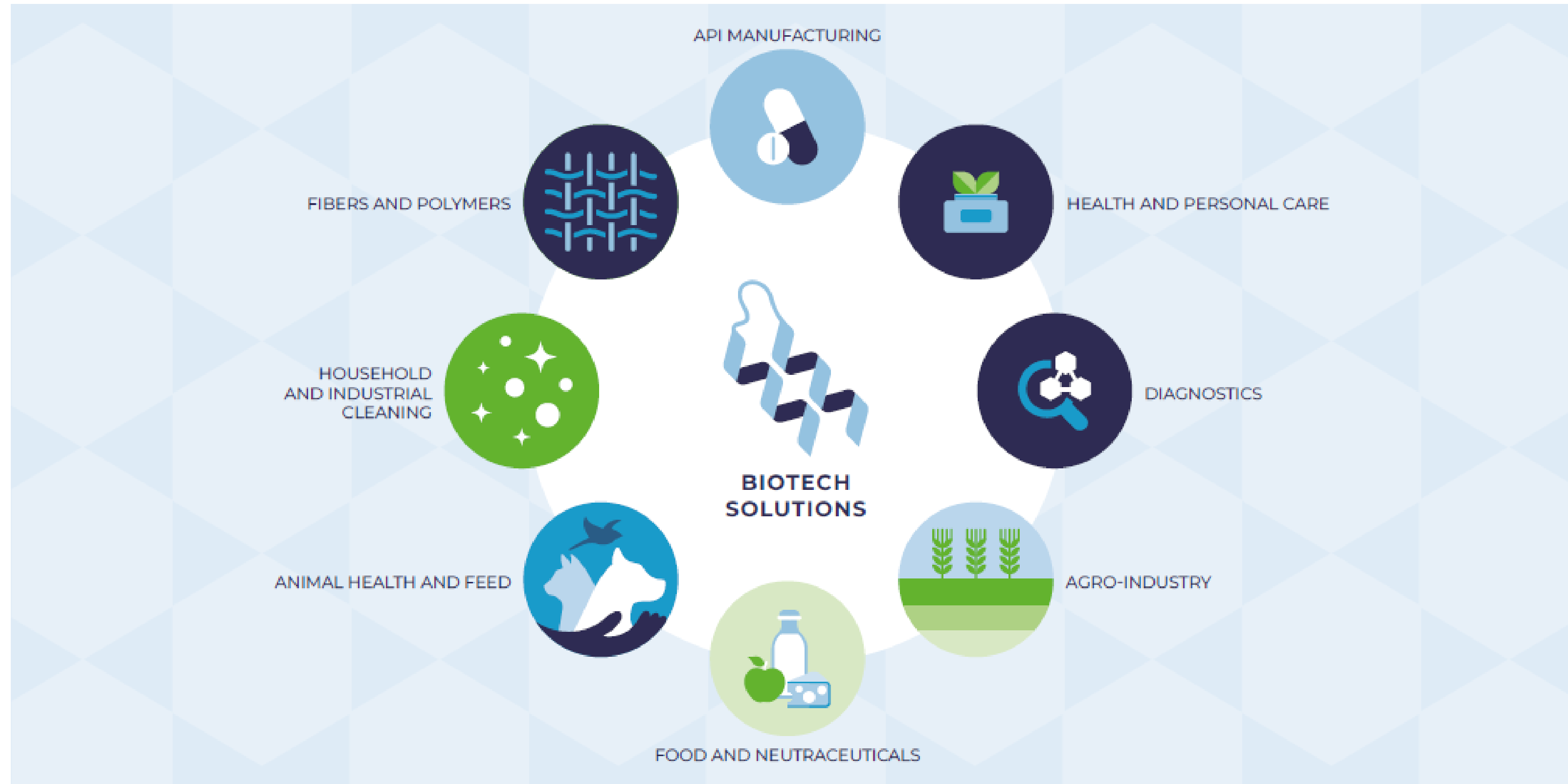
Company presentation

THINK GREEN
GO BIOTECH



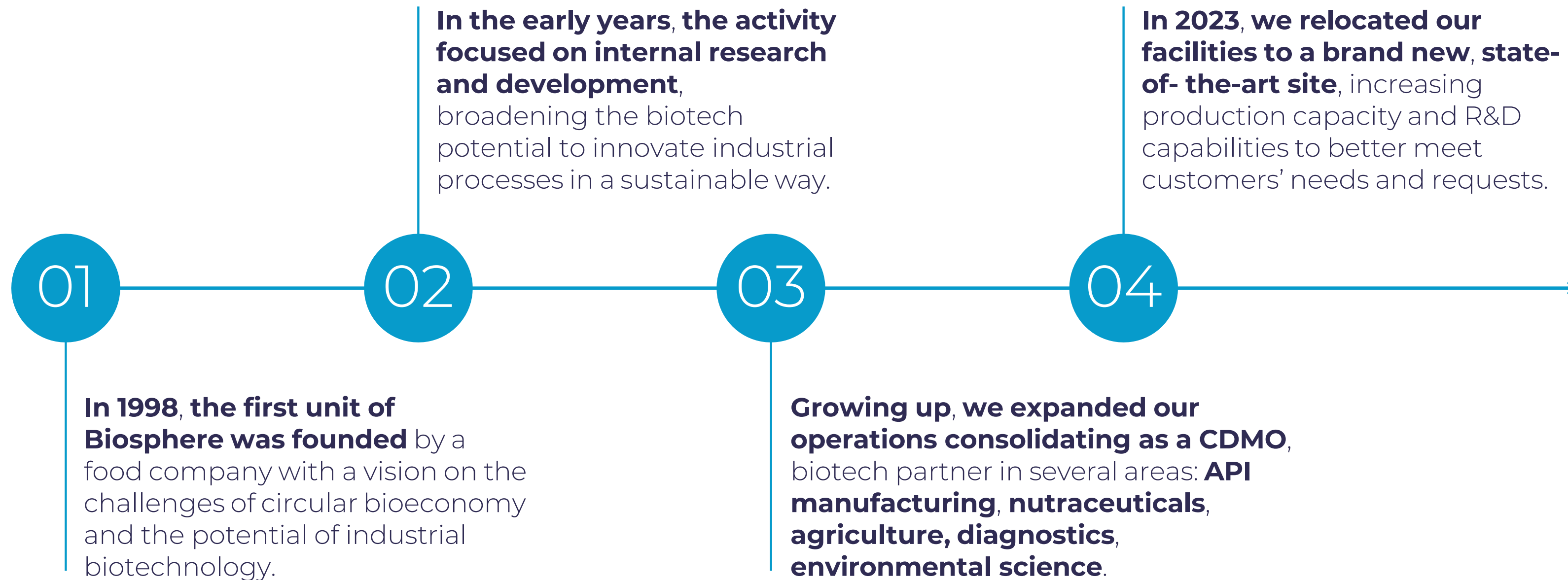
WHAT WE DO

INDUSTRIAL BIOTECH SOLUTIONS
FOR A WIDE RANGE OF APPLICATION



THEN AND NOW

The steps of our history



WHO WE ARE

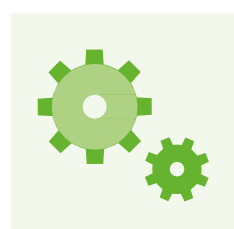
OUR TEAM

A unique crew, many key areas of expertise

**PROJECT MANAGEMENT**

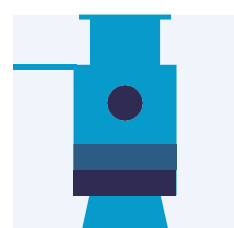
Our project managers ensure that:

- the project **stays on track**;
- **deadlines** are respected;
- **results** are communicated and delivered during regular meetings.

**PROCESS DESIGN**

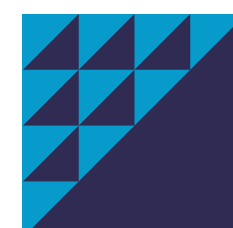
Our process scientists guarantee:

- development of efficient and **scalable** processes;
- **optimization** of resources;
- **minimization of waste**.

**MICROBIOLOGY AND FERMENTATION**

Our biotechnologists **mastering the art of:**

- **enzyme engineering**;
- **genetic modification** and **evolution** of microorganisms;
- **fine-tuning** of culture conditions.

**DOWNSTREAM PROCESSING**

Our chemists have in-depth experience in:

- the **separation** and **purification** of enzymes and desired compounds from **complex mixtures**;
- **immobilization** and **formulation** of your end products.

**BIOCATALYSIS**

Our biochemists are at the forefront of biocatalytic innovation:

- identifying **solutions for specific bioconversion reactions**;
- developing **tailor-made enzymatic processes**.

**SCALE-UP**

Our process scientists and engineers:

- drive fast and effective processes scale-up, **from laboratory- scale experiments to industrial production**;
- ensure fully implementation of biotech innovations into the client's processes.

**FULL SCALE INDUSTRIAL MANUFACTURING**

Our process engineers and quality experts warrant:

- **timely execution** of the production campaigns;
- **adherence** to local, regulatory and the client's regulations and requirements;
- execution of **high quality** operations, registration and documentation.

WHAT WE DO

OUR CDMO BUSINESS MODEL

We don't just provide services, we establish cooperations

Our business model is centered around delivering **customized contract R&D** and **contract manufacturing** solutions in the field of industrial biotechnology, **tailoring our approach** to meet any specific need.

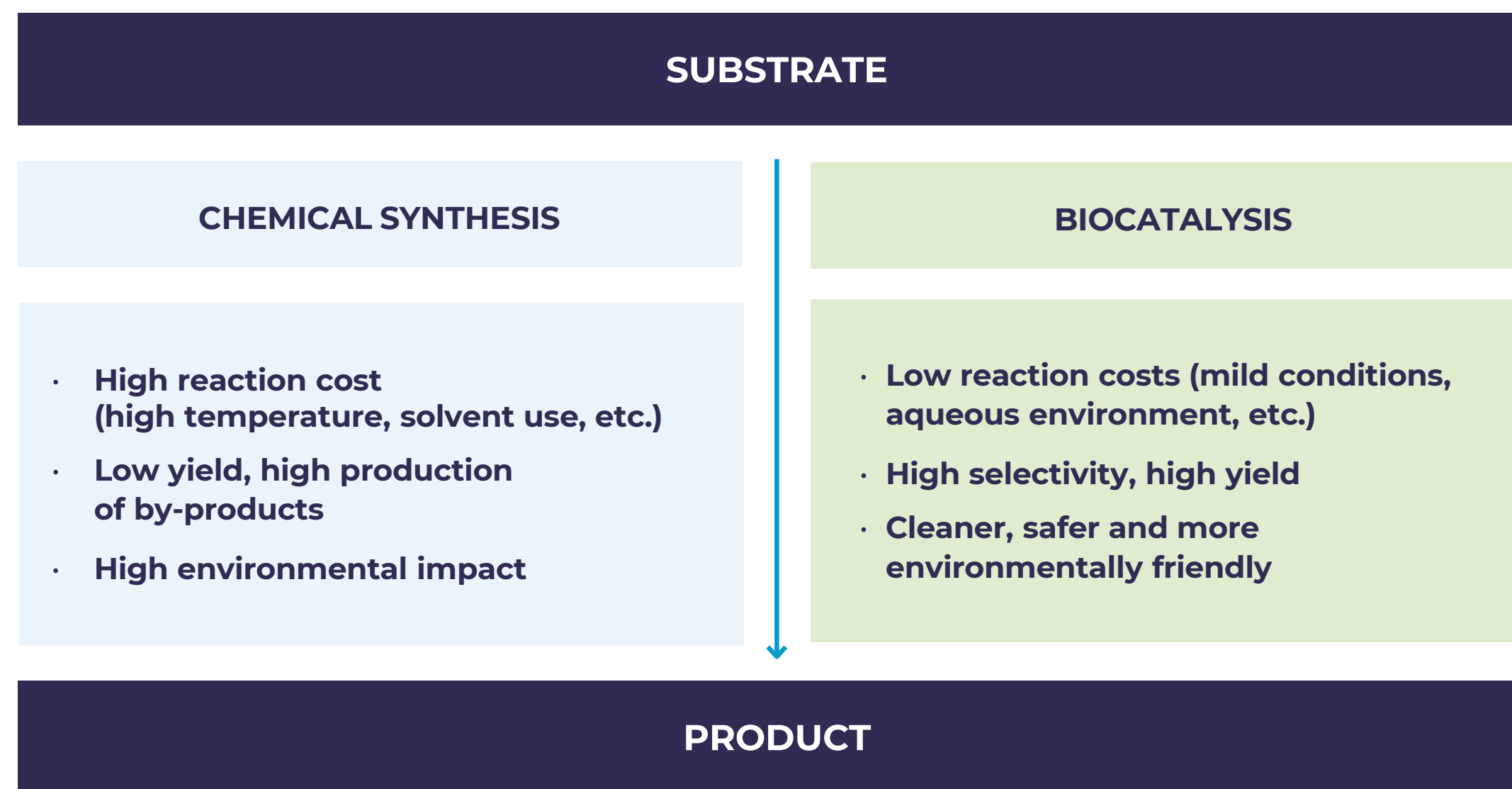
We prioritize **confidentiality** and **exclusivity** in our partnerships, to **protect customers' intellectual property**, data, ideas, innovations **and sensitive information**.



CONTRACT R&D

Biocatalysis process development

Bioconversion processes use the power of enzymes to transform substrates into products through innovative synthesis steps that are alternative to traditional chemistry.



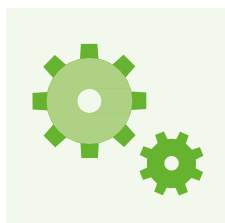
We are specialized in creating **tailor-made enzymes, engineered to meet the unique requirements** of our clients' bioconversion projects.

Our team of enzyme experts **designs and optimizes these biological catalysts**, taking care of all the steps to ensure they are highly specific, efficient, and reliable:

- > enzyme **identification** and preliminary **screening**;
- > enzyme **engineering and evolution**;
- > development of a **fermentation and downstream process** for the production of the biocatalyst;
- > development of a fully implemented **bioconversion process**, with the definition all parameters: substrate solubility and stability of the enzyme in the presence of solvents, enzyme/substrate ratio, temperature, pH, co-factors use.

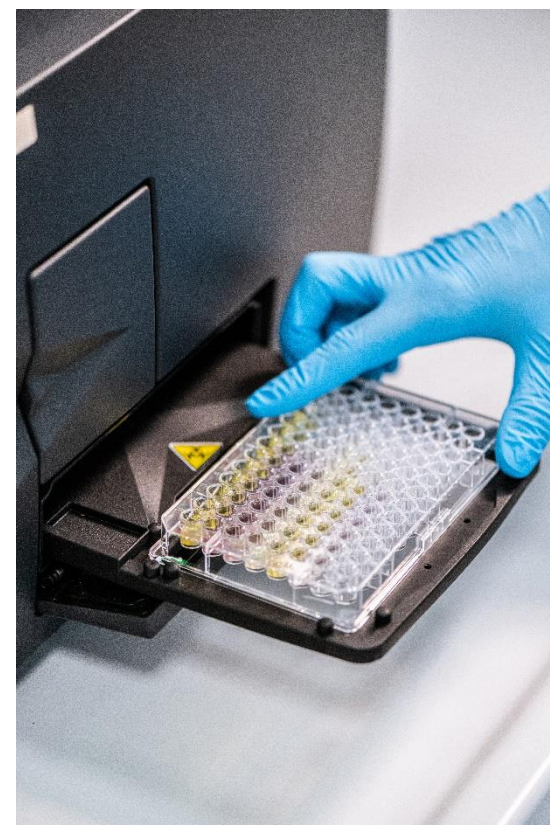
WHAT WE DO: BIOTECH SOLUTIONS

FROM R&D TO FULL SCALE INDUSTRIAL PRODUCTION



Biocatalyst: from the identification of the enzyme to the proof of concept of the bioconversion process.

- > **Identification of candidate enzymes** for the specific biocatalytic process
- > **Screening and selection** of the best performing candidate
- > **Optimization** of the biocatalyst through enzyme engineering
- > **Identification of the best host/vector** production system
- > **Identification of the biocatalytic reaction** conditions
- > **Proof of Concept** of the biocatalytic process



EXPRESSION SYSTEM SCREENING

Different production **host strains** and **expression vectors** can be combined and screened for best performance at microtiter scale.

HIGH PRODUCTION CLONE SCREENING

The best production strain pool is screened for presence of highly **stable** and **high production** clones.

Clones are isolated on agar and tested in **deepwell expression trials** using *Enzyscreen* technology.

Specific productivity is assayed by **SDS-page**. Enzymatic activity of the best production clone is confirmed by **activity assays**.

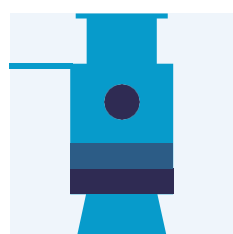
CELL BANKING

The selected production clone is finalized with the generation and characterization of:

- Master Cell Bank
- Working Cell Bank

WHAT WE DO: BIOTECH SOLUTIONS

FROM R&D TO FULL SCALE INDUSTRIAL PRODUCTION



Upstream process development

- > **Growth** medium and fermentation condition screening
- > **Lab scale** fermentation process development

Several medium and growth conditions are **screened in deepwell microtiter** fermentation DoE using *Enzyscreen* together with *Tecan Infinite M200* technology.

Fermentation variables are tested in DoE adopting batch or fed-batch strategies to obtain information on **best and most robust conditions** for batch fermentation.

Samples are analyzed for **specific and volumetric productivity** (SDS-page, activity assay and/or biocatalytic performance by HPLC).



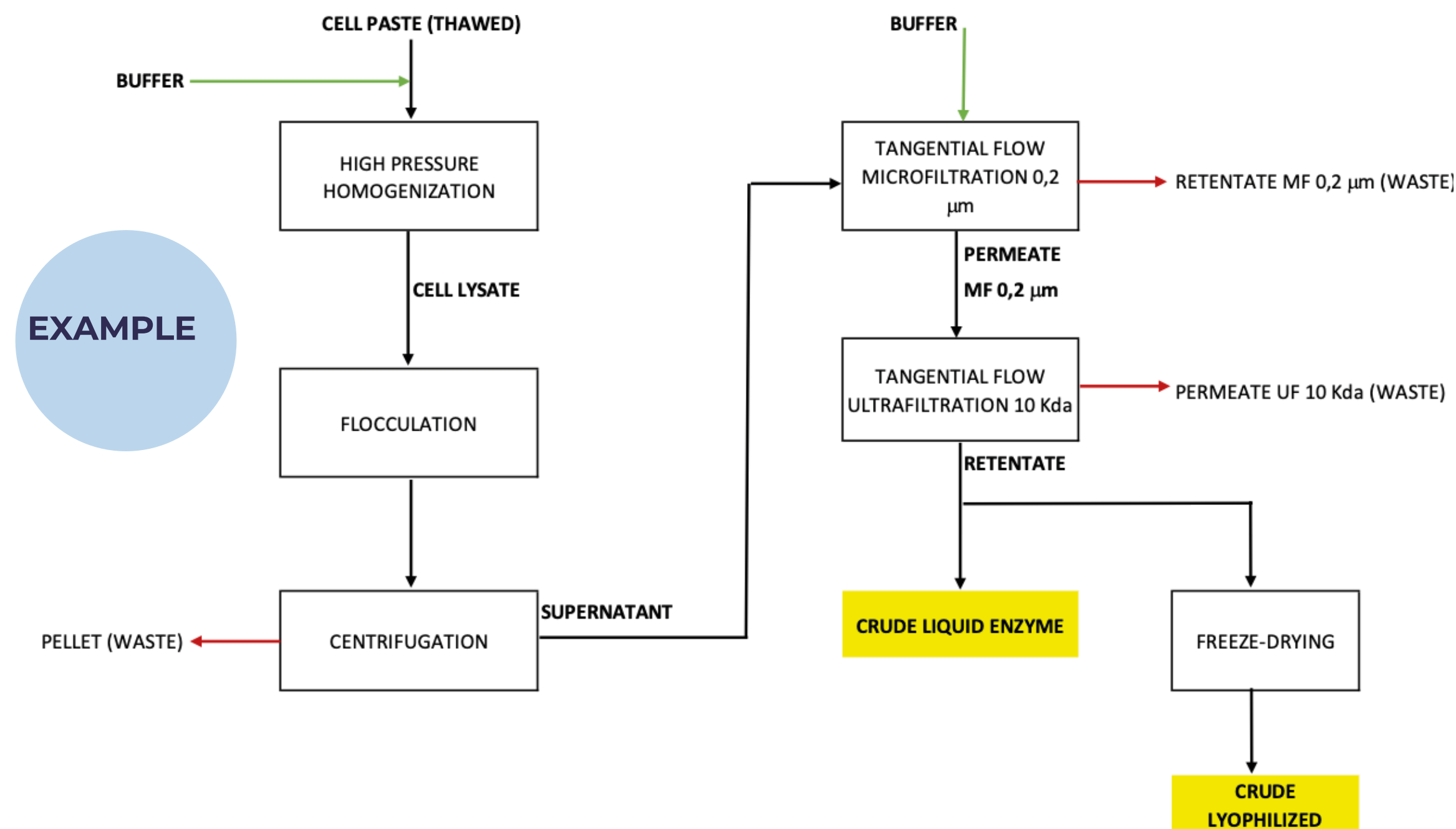
FROM R&D TO FULL SCALE INDUSTRIAL PRODUCTION



Downstream process optimization and definition of enzyme formulation

The downstream process is **set up** with an eye on the requirements for the enzyme use in biocatalysis.

During the set up, single steps are **challenged** and **optimized** for the achievement of the best solution in terms of quality, performance, production costs.



WHAT WE DO: BIOTECH SOLUTIONS

FROM R&D TO FULL SCALE INDUSTRIAL PRODUCTION



Optimization of the biocatalytic process (DoE)

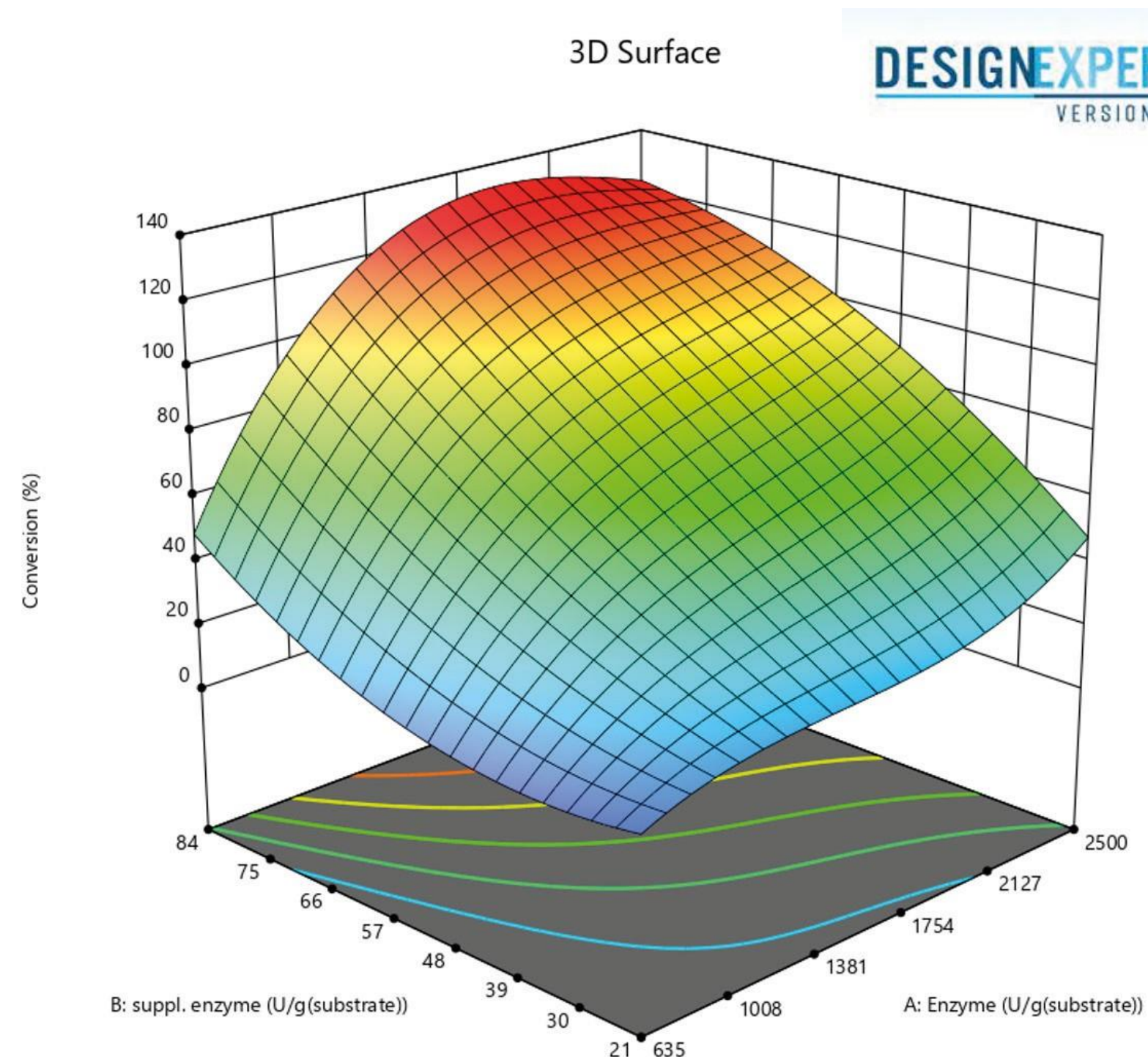
Specialized Software is used to generate the experimental design for optimization of the biocatalytic process.

Variables taken in consideration are: quantity of enzyme, quantity of cofactor, quantity of coenzyme, buffer conditions, solvents, surfactants, pH, temperature, time, etc..

A statistically significant **response surface model** will indicate the best biocatalytic conditions. These conditions will be verified for performance prior to proceeding to the next phase.

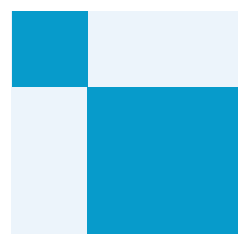
Build Information

File Version	13.0.10.0			
Study Type	Response Surface		Subtype	Randomized
Design Type	D-optimal	Both Exchanges	Runs	90
Design Model	Reduced Cubic		Blocks	2



WHAT WE DO: BIOTECH SOLUTIONS

FROM R&D TO FULL SCALE INDUSTRIAL PRODUCTION



Scale-up and industrialization of the process

5L

Consistency runs



100L

Pilot runs



1000L

Demo scale run (upstream and downstream)



At the end of the development and demo phases, Biosphere's production facility can guarantee, through **long-term agreements**, industrial manufacturing and **exclusive** supply.





Your biotech partner

Your biotech partner

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